Chapter IV

SPECIES OF SPECIAL CONCERN IN U.S. WATERS

Section 202 of the Marine Mammal Protection Act directs the Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, to make recommendations to the Departments of Commerce and the Interior and other federal agencies regarding research and management actions needed to conserve species and stocks of marine mammals.

To meet this charge, the Commission devotes special attention to particular species and populations that are vulnerable to the effects of human activities. Chapter V presents information pertaining to species occurring primarily in foreign and international waters. This chapter focuses on species occurring in U.S. waters. Such species may include marine mammals listed as endangered or threatened under the Endangered Species Act or as depleted under the Marine Mammal Protection Act. In addition, the Commission often directs attention to other species or populations of marine mammals not so listed when they face special conservation challenges.[1]

North Pacific Right Whale (*Eubalaena japonica*)

Marine mammal scientists recognize three right whale species. The North Pacific right whale (*Eubalaena japonica*) also is highly endangered and may number in the hundreds (IWC 2001).The North Atlantic right whale (*E. glacialis*) is highly endangered and consists of about 400 individuals. In contrast, the southern right whale (*E. australis*) probably numbers well over 10,000 range-wide (combining regional estimates reported for South Africa, Australia, New Zealand, and Argentina/Brazil at the IWC workshop on southern right whales in Buenos Aires in September 2011; IWC in press).

Between 1835 and 1910, commercial whalers discovered and nearly extirpated the North Pacific right whale (Scarff 2001, Josephson et al. 2008). During that period more than 15,500 right whales were killed in the North Pacific Ocean and Bering Sea. The vast majority of those whales were killed during a 20-year period from 1845 to 1865 when as many as 300 to 400 ships were deployed for that purpose. No calving ground for right whales in the North Pacific was reported by the whalers, and such grounds remain unknown today. It is likely that by 1910 no more than a few hundred right whales survived throughout the ocean basin. North Pacific right whales are believed to comprise two separate populations or stocks: one with summer feeding grounds in the southeastern Bering Sea and Gulf of Alaska, and the other with feeding grounds in the western North Pacific and in the western Bering Sea and the Okhotsk Sea.

In 1935 a global ban on hunting right whales went into effect under the League of Nation's Convention for the Regulation of Whaling, and this ban has been carried forward to the present by the International Whaling Commission under the International Convention for the Regulation of Whaling, which was signed in 1946 and became effective in 1948. However, despite the ban, whalers from the former Soviet Union killed at least 371 right whales in the Gulf of Alaska and southeastern Bering Sea off Alaska and another 127 right whales off Russia between 1963 and 1967 (Doroshenko 2000). These illegal

[1] During review of a draft of this report, a representative of the Fish and Wildlife Service suggested that the Antillean manatee warrants consideration as a "species of special concern." The Commission concurs with that suggestion and will report on the Antillean manatee in its 2012 annual report.

kills undoubtedly decimated the two populations for a second time. Today, both the North Pacific right whale and the North Atlantic right whale (*E. glacialis*) are highly endangered. At the population level, the eastern North Pacific right whale population is at grave risk of extinction, with an estimated 31 whales remaining (described below; see Wade et al. 2011).

Current status

Scientists know little about the right whales surviving in the western North Pacific offshore of Russia. Right whale sightings in the eastern North Pacific nearly ceased in the decades following the episode of illegal whaling in the 1960s. However, in 1996, four right whales were observed feeding together in the southeastern Bering Sea on the western edge of Bristol Bay (Goddard and Rugh 1998). Since then the National Marine Fisheries Service has organized a series of aerial and/or ship-based surveys for right whales in the southeastern Bering Sea. Service scientists have focused on developing a photo-identification catalogue, collecting and analyzing genetic samples, tagging and tracking individuals with satellite telemetry, and monitoring acoustically to detect vocalizing right whales (Moore et al. 2006; Munger et al. 2008). In 2008 the Service designated areas where right whales have been seen most often since 1980 as critical habitat (Figure IV-1).

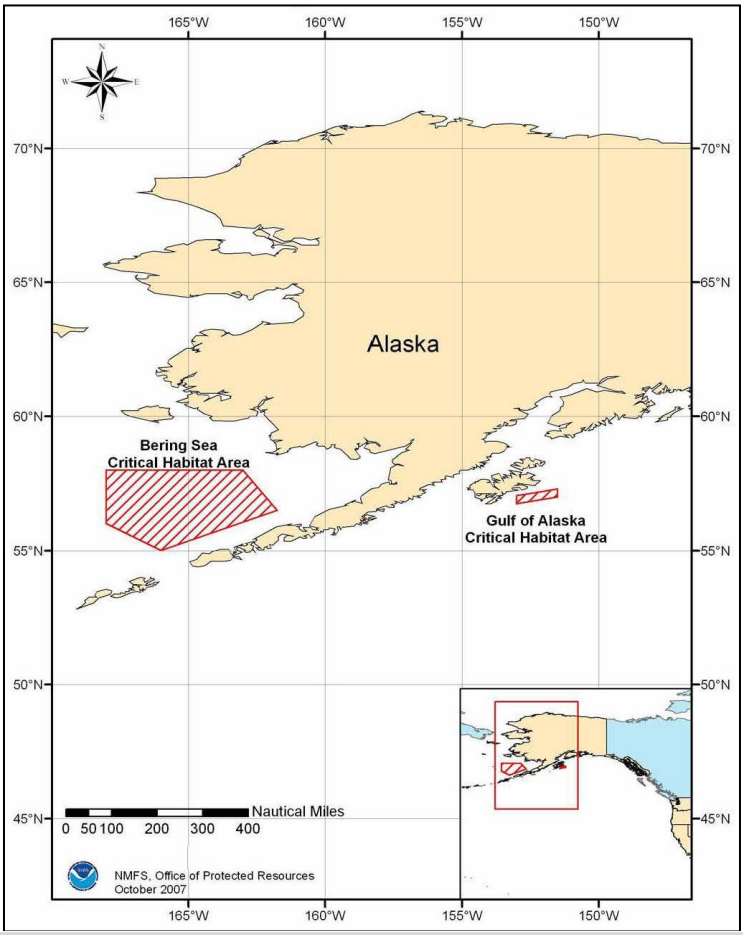

Figure IV-1. North Pacific right whale critical habitat areas designated by the National Marine Fisheries Service in 2008. (Source: National Marine Fisheries Service)

In 2008 the Department of the Interior's Minerals Management Service (now the Bureau of Ocean Energy Management) was planning an offshore oil and gas lease sale in the North Aleutian Basin of the southeastern Bering Sea, one of two areas where North Pacific right whales have been seen in recent years. The Minerals Management Service entered into an agreement with the National Marine Fisheries Service to fund a multi-year (i.e., 2007–2011) study of the distribution, abundance, and habitat use of right whales in the southeastern Bering Sea. Research activities conducted prior to 2010 are discussed in previous Marine Mammal Commission annual reports. To protect the area's rich biological resources and fisheries, in March 2010 President Obama withdrew the North Aleutian Basin from the Bureau of Ocean Energy Management's five-year leasing plan. As a result, the Interior Department cut its funding for the right whale study from about $1.5 million to less than $400,000. Given the reduction in funding, and limited funding from the National Marine Fisheries Service, 2010 vessel surveys were shortened substantially and aerial surveys were canceled.

In August 2010 the National Marine Fisheries Service conducted a 24-day survey to photograph and collect biopsy samples from right whales, apply satellite tags, and service acoustic buoys previously deployed to monitor right whale vocalizations. Several right whale calls were heard during the survey but the animals could not be located and were not observed visually. However, the survey successfully retrieved several acoustic buoys, collected their acoustic data, and then redeployed them. In mid-September 2010, one right whale was sighted in critical habitat when the same research vessel transited the area on another research project. Scientists on the vessel also recorded right whale vocalizations, which they attributed to the same whale.

In 2010 Service scientists published an important analysis of sightings and biopsy samples collected over the past decade (Wade et al. 2011). They estimated that the eastern North Pacific right whale population numbers just 31 whales (95 percent confidence limits 23–54) based on photo-identification records or 28 (95 percent confidence limits 24–42) based on genetic analyses. They also estimated that the population consists of 8 females (95 percent confidence limits 7–18) and 20 males (95 percent confidence limits 17–37). They concluded that the eastern North Pacific right whale population is the world's smallest and most endangered large whale population and that its dire state is a direct result of illegal Soviet whaling in the 1960s. Their findings and conclusions underscore the need for improved international management to ensure that the population's apparent lack of recovery is not related to current human activities.

In 2011 the Services further reduced funding for North Pacific right whale research, restricting activities largely to compilation and analysis of past data and continued passive acoustic monitoring. The only survey work in 2011 was a one-week cruise that encountered poor sighting conditions, detected no right whales visually, but collected new acoustic data.

Preliminary analyses suggest that during summer and early fall right whales feed primarily on copepods at or near the ocean bottom over the middle-continental shelf in the southeastern Bering Sea, but rarely move into water shallower than about 50 m. They also indicate that a small number of right whales can make thousands of calls in over periods of just tens of hours. Further study is needed to determine the function of such extensive vocalizations.

The distribution of North Pacific right whales in winter and spring months is not known. Scientists recently matched photographs of an individual whale taken on 2 April 1996 off Hawaii and on 30 July 1996 in the Bering Sea (Kennedy et al. 2011). This photographic match provides the first documentation of movement between low and high latitudes by an individual whale from this population and thus confirms that at least part of the population undertakes long distance movements (Kennedy et al. 2011) similar to the migrations of other right whales.

The year 2011 was the final year of funding from the Bureau of Ocean Energy Management through its interagency agreement with the National Marine Fisheries Service. Because of budget reductions for protected species research within the Service, no further field work to study or monitor North Pacific right whales was being planned at the end of 2011, although passive acoustic monitoring has continued by piggy-backing on other studies supported by the Bureau of Ocean Energy Management. In addition, the Service has decided not to request funds for work in future years. Such research is essential to determine whether vessel traffic, fishing gear, oil and gas development, and other human threats might be affecting North Pacific right whale populations and impeding their recovery.

North Atlantic Right Whale (*Eubalaena glacialis*)

As noted previously, the North Atlantic right whale currently numbers about 400 individuals and is highly endangered. Historically, the North Atlantic right whale consisted of two populations, both of which migrated between winter calving grounds along subtropical coastlines and summer feeding grounds in northern temperate waters. The eastern population is thought to have calved off southern Europe and northwestern Africa. The western population calves in winter, primarily off the southeastern United States

(northeastern Florida and Georgia), and feeds in summer, primarily off New England and southeastern Canada.

The eastern North Atlantic right whale population was driven extinct by whaling that started at least as early as the 11th century and continued through the early 20th century. The last records of whales thought by some to have belonged to this population include an adult female and a mother-calf pair that were killed by shore-based whalers off Madeira in the mid 1960s and a whale of unknown sex and age that was killed off the Azores in 1969 (Brown 1986, Reeves et al. 2007). The western population also was subject to centuries of whaling and may have been reduced to fewer than 100 animals by the early 1900s (Reeves 2001).

The status of the western North Atlantic population appears to be improving. In the 1990s, scientists could identify about 325 individual whales. The number of observed calves at that time averaged about 11 or 12 per year and the number of observed carcasses averaged between two and three per year. Knowlton et al. (1995) estimated the population growth rate at 2.5 percent per year. After 2000, annual calf counts doubled to an average of about 23 calves per year, including a record 39 calves born in the winter of 2008–2009. In 2010 and 2011, scientists counted 19 and 21 calves, respectively. The recent population estimates of 400 or more whales plus the increased calf counts are positive signs and support the idea that the status of the population is improving.

Summer feeding areas used by most North Atlantic right whales are relatively well known, but wintering areas are well known only for females bearing calves and some juveniles. In December 2008 an aerial survey team from the National Marine Fisheries Service observed 44 right whales in the central Gulf of Maine. These sightings may have revealed a previously unknown winter mating area (NOAA 2008). In 2010, the Marine Mammal Commission provided partial funding for four vessel surveys undertaken by the New England Aquarium and the Canadian Wildlife Institute to look for right whales in the central Gulf of Maine area during the winter of 2010–2011. Preliminary analyses indicate that at least 13 different whales were photographed. In addition, on one of the survey days, a National Marine Fisheries Service aerial survey team counted 28 right whales in the region. Accumulating information suggests that this area is used regularly in winter by at least some right whales. Furthermore, if females identified there can be matched with calving mothers in the southeastern U.S. in the winter of 2011–2012, the evidence would support the hypothesis that this region is indeed a winter mating ground for the species.

All right whales worldwide have been protected by an international ban on commercial hunting since 1935 when the League of Nations' Convention for the Regulation of Whaling went into effect (Burnie 1985). The ban continues to the present day under the 1946 International Convention for the Regulation of Whaling. Although perhaps half a dozen North Atlantic right whales were taken contrary to the ban between 1935 and 1970 (Reeves et al. 2007), commercial whaling is no longer considered a threat to North Atlantic right whales. Each year, however, a few North Atlantic right whales are killed or seriously injured by entanglements in commercial gillnets or shellfish trap lines and by ship strikes. Thus, entanglement and ship strikes are the principal threats to conservation of this species and likely responsible for the population's low rate of recovery.

Under the Marine Mammal Protection Act and Endangered Species Act the National Marine Fisheries Service has lead responsibility for protecting right whales. To improve protection from ship strikes and entanglements, the Service has adopted several new regulations over the past four years. In particular, it now (1) restricts vessel speeds in certain areas along the east coast where right whales are most likely to be hit, (2) bans the use of gillnets in much of the calving grounds during the calving season, and (3) requires use of certain types of rope in most east coast trap fisheries to lessen the risk of lethal entanglement. Additional efforts to protect the species in 2010 and 2011 are discussed below, after the section describing right whale deaths and serious injuries from ship strikes and entanglement in fishing gear in 2010 and 2011.

Documented right whale deaths and injuries in 2010 and 2011

Figure IV-2 summarizes right whale deaths confirmed by observed carcasses since 1970. Since 2000, scientists and other observers have confirmed 48 deaths, half of which they have attributed to either ship strikes (16 deaths) or entanglements in fishing gear (9 deaths). Not all carcasses are recovered and examined closely—some are seen only briefly floating offshore. Thus, at least a few confirmed deaths attributed to "unknown" causes likely are related to ship strikes or entanglements. In addition, because an unknown number of whales die unseen and either sink or are eaten by scavengers before being reported, the deaths included in Figure IV-2 under-represent total mortality caused by ships and fishing gear by an uncertain amount. Also, each year some live right whales are seen entangled or injured to varying degrees as a result of interactions with ships or fishing gear.

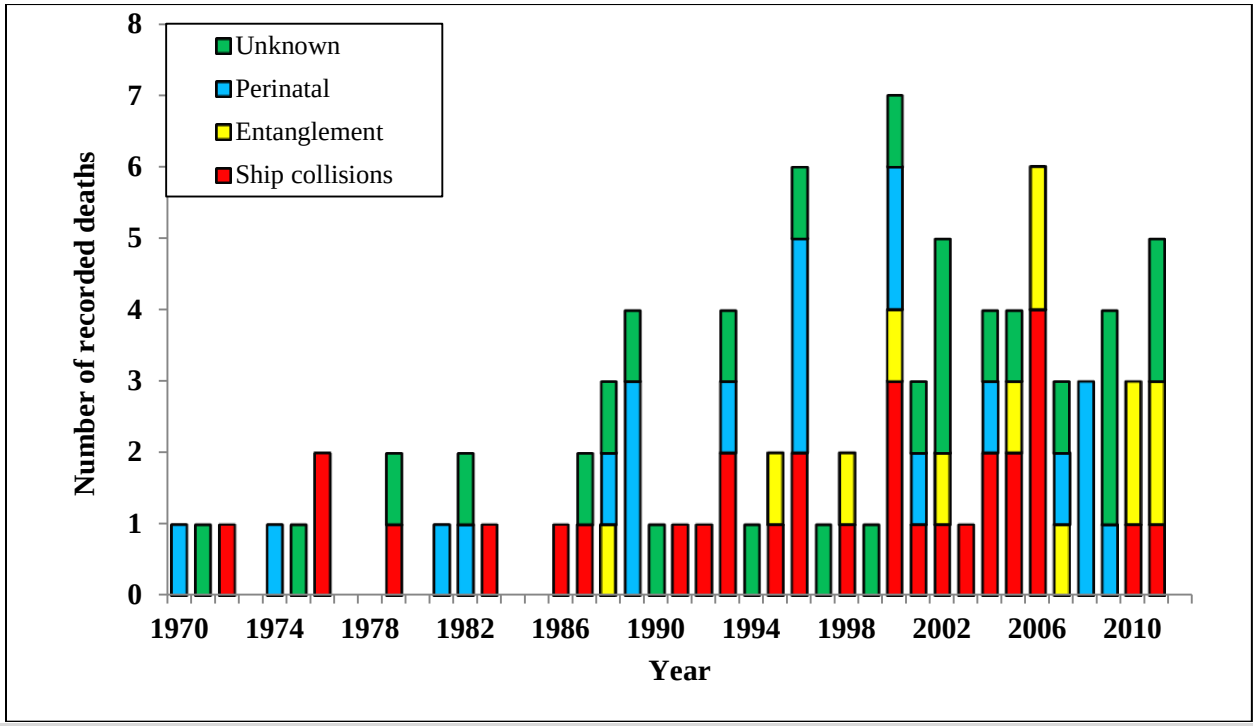

Figure IV-2. Known sources of mortality for North Atlantic right whales, 1970–2011 (Source: Marine Mammal Commission unpublished data)

Recent right whale deaths: In 2010 and 2011 eight right whale deaths were confirmed: four were attributed to entanglement, two to ship strikes, and two were unknown causes. In 2010, the first death was an adult male found by the Coast Guard on 27 June floating about 35 nmi east of Cape Cod, Massachusetts, and towed ashore for necropsy. It was too badly decomposed to be matched to individuals in the right whale photo catalogue. Scientists collected tissue samples to determine if they could identify the individual using genetic analyses, but they had not completed those analyses by the end of 2011. The whale had entangling line wrapped around its rostrum and line had caused severe wounds to its right flipper. Its death was attributed to entanglement.

The second death in 2010 involved an unidentified yearling seen floating off northern Maine near the town of Jonesport on 2 July. Lacerations detected during a necropsy after it later washed ashore indicate that it died of injuries from a ship collision.

The third death involved an unidentified adult male that washed ashore on 12 August near Digby, Nova Scotia, along Canada's Bay of Fundy. Although initial reports of a fractured rostrum suggested that

the whale had been struck by a ship, necropsy results indicated the fracture occurred after the whale had died and that it was instead a victim of entanglement in fishing gear that may have caused it to drown. The evidence of the entanglement included line marks on the whale's underside and linear abrasions at the base of its flipper causing decomposition of the underlying tissue.

The first death in 2011 involved a two-year old female (#3911) first sighted alive, but in poor condition, by an aerial survey team on Christmas day, 2010, ten nmi east of Jacksonville Beach, Florida. The whale had line, possibly from a trap pot, trailing from its mouth and cutting deeply into its right flipper. Other entangling gear included trap/pot fragments and associated gangions (some of which was found inside the animal's mouth). Over the next three weeks scientists made extensive efforts to track and disentangle the animal. On 15 January they were able to sedate the whale and remove 150 feet of line. It was found dead on 1 February 2011 floating 11 nmi off Palm Coast, Florida. It was towed ashore for a necropsy and the results indicated that it had died from entanglement-related injuries.

The second death in 2011 involved a badly decomposed whale photographed on 19 February floating 80 miles east of Charleston, South Carolina. It could not be retrieved and therefore was listed as having died of unknown causes.

The third death in 2011 involved a juvenile whale that stranded on the Cape Romaine National Wildlife Refuge, South Carolina, on 16 March. It had died of entanglement injuries. Line of unknown origin was bound tightly, in multiple wraps, around its right flipper.

The fourth death in 2011 was an adult female (#1308) that stranded on Nags Head, North Carolina, on 27 March. Multiple fractures of the skull and vertebrae indicated it had been killed by a ship. This was only the second whale known to have been killed by a ship in U.S. waters since the Service adopted new rules to restrict vessel speed in 2008 and the first known to have been killed near one of the regulated areas. The whale had been sighted earlier in 2011 with a newborn calf that presumably also died once deprived of its mother's care.

The last known death in 2011 also involved an adult female (#1303) known to have given birth to at least six calves since she was first identified in 1979. The carcass was photographed floating 10 km east of Chincoteague Island, Virginia, on 17 May. The observers did not report the whale until several days later and efforts to relocate it and determine cause of death were unsuccessful.

Recent right whale injuries: In addition to the known right whale deaths just described, three other whales were seen alive but entangled in 2010 and 10 others in 2011. In 2010 the first observed living, entangled whale was an adult male (#2470) sighted by an aerial survey team on 13 May about 100 km (60 mi) east of Cape Cod, Massachusetts. It was photographed with a series of wraps around its flukes and 150 feet of trailing line. It had last been seen gear-free in late January in the central Gulf of Maine. A disentanglement team arrived within two hours of the sighting and was able to cut the lines from the whale's back allowing all of the gear to fall free. Although the whale did not appear to be thin, which might suggest trouble feeding, it had broad patches of whale lice on its body and tail and a number of raw wounds suggesting that it was in poor condition. It was resighted multiple times in 2011 with improved health and healed wounds.

A whale research group spotted the second living entangled whale in September 2010. This adult female (#1503), sighted at Jeffreys Ledge off the New Hampshire coast, was in poor condition and had line wrapped around its rostrum and caught in its baleen. Poor weather prevented the disentanglement team from responding and the whale has not been sighted again. Its previous sighting with no gear attached had been on 13 April in Cape Cod Bay.

A whale research group also spotted the third entangled whale, an adult male (#3120), at Jeffreys Ledge on 20 October 2010. It appeared to be in good condition but had line draped loosely over its back and netting (possibly with a buoy attached) that was caught on its flukes. A disentanglement team could not respond because the report was not received until late in the day. An aerial survey team spotted the whale again at Jeffreys Ledge on 29 November, but the entangling debris was not detected until photographs were analyzed the next day. The animal was sighted again—this time gear-free—on 19 September 2011.

The 10 new right whale entanglements in 2011 were the most recorded in a single year. Disentanglement efforts were not possible for most of those cases. However, four cases were minor and the whales either shed or appeared to have shed the gear by themselves within a few months. One was an adult female (#3010) with a calf first seen entangled on 19 January off St. Augustine, Florida. On that day it was trailing rope with a small black buoy, but it was seen a month later free of the gear and still with her calf.

The second of those four cases was also an adult female (#3712) and was first seen entangled off St. Augustine on 30 January. On that date it had a small amount of netting and attached floats over its back, but it was resighted gear-free on 10 April off Massachusetts.

The third case involved a juvenile (#3893) seen in Cape Cod Bay on 17 March and entangled in a gillnet float rope. This whale was resighted in the Bay at the end of April and was apparently gear-free.

The fourth case involved a one-year old whale (#4040) seen 22 April in Cape Cod Bay with a single line through its mouth and trailing back on either side 50 feet behind the flukes. A disentanglement team located the whale the same day and was able to cut the line and pull it free, successfully removing all line and leaving the animal in good condition.

Five other cases involved whales that were still entangled when last sighted in 2011 or were not resighted. One was a juvenile male (#3993) seen on 13 February, 22 miles off Tybee Island, Georgia, with line trailing down its right side ending 10 feet past its flukes. The second was a juvenile male (#3302) first photographed by whale researchers on 22 April south of Martha's Vineyard with line crossing the head just aft of the blowhole and resighted still entangled on 9 November in the central Gulf of Maine, Canada. The third was an adult female (#3123) seen on 29 April in Cape Cod Bay with either rope or netting possibly caught in the mouth or on the right flipper. It was resighted still entangled on 19 September in the Bay of Fundy. The fourth was a juvenile (#4090) reported by a whale-watching boat on 18 September on Jeffreys Ledge off New Hampshire. It appeared at the time to be anchored (held fast) by gillnet gear, but it could not be relocated after that sighting. The fifth case involved an adult male (#3111) found entangled in the Bay of Fundy, Canada, on 27 September by a disentanglement team that was searching for another entangled whale. The whale had line trailing from its mouth to 20 feet behind its flukes. Although the whale appeared to be lethargic and in poor condition, it successfully evaded disentanglement efforts and was not resighted before the end of 2011.

Figure IV-3. A three-year-old North Atlantic right whale (#3853) photographed off Hilton Head, South Carolina, on 25 January 2011with potentially lethal propeller wounds from a ship collision. It had been seen uninjured five days earlier in the same area. It was not seen again in 2011. (Photo courtesy of EcoHeath Alliance under NOAA permit # 594-1759)

The tenth whale seen entangled was a juvenile female (#3760) seen entangled 35 nmi off Brunswick, Georgia, on 13 February with monofilament line exiting both sides of the mouth. A disentanglement team was able to reach the animal the same day and cut the line at one point, but no gear was removed. However, the whale was confirmed to have shed some gear by 25 April.

One other whale, a juvenile male (#3853), was seen by a right whale aerial survey team with 14 large propeller slashes on its back 15 miles off Hilton Head Island, South Carolina, on 20 January (Figure IV-3). It had been seen uninjured just five days earlier in the same general area. Despite the injury, it seemed to behave normally. However, it was not resighted in 2011 and its fate is uncertain.

In addition to the 14 new entanglements documented in 2010 and 2011, various parties resighted nine other whales that had last been seen entangled in previous years. Six of those were confirmed to have been gear-free and in good condition. Two others were sighted gear-free in fair condition, and one other was seen still entangled.

Records collected by the New England Aquarium from 2000 to the end of 2011 describe a total of 65 live North Atlantic right whales either entangled or with serious injuries from entanglement. Table IV-1 summarizes the fate of those whales. Forty-six cases have been resolved because the whales were either resighted gear-free in good condition (35 cases), were found dead (8 cases), or are assumed dead (3 cases[2]). Sixteen cases remain unresolved either because the whales were last seen still entangled (8 cases) or because they were last sighted free of gear but had not yet fully recovered from their injuries (8 cases). Three other entanglements involved unidentified whales whose fate could not be determined. Since 2000 (including the whales observed entangled in 2010 and 2011), disentanglement teams have been able to remove at least some gear from about one-third of all observed entanglements. Another third involved minor entanglements and disentanglement efforts were deemed unwarranted because the gear was considered likely to fall off by itself. For the remaining third, disentanglement efforts were considered warranted but were precluded by weather, the whale's location when sighted, the time of day when the whale was sighted, or other factors.

Mitigating Ship strikes

Ship strikes are a major cause of right whale mortality. Since 1990, 24 of 68 documented right whale deaths were attributed to strikes by large ships based on evidence of propeller slashes and/or bone fractures. Undoubtedly, other right whales have been killed by ship strikes but their deaths were unaccounted for because the carcasses were not observed or, if observed, could not be examined sufficiently to determine cause of death. The loss of so many animals from such a small population is a significant impediment to species' recovery.

In the mid-1990s, the Marine Mammal Commission began recommending that the National Marine Fisheries Service adopt seasonal limits on the speed of large vessels in high-use right whale habitat. Action on those recommendations was slow, in part because it was unclear what speed might be considered safe for right whales and if such a measure would significantly reduce ship strike risks. To help address those questions, the Commission supported a compilation of records of ship strikes on large whales worldwide. The results revealed that such strikes were far more common than previously recognized for several large whale species, particularly fin, humpback, and sperm whales as well as right whales; that most deaths were caused by large ships; that whales usually were not seen in time for vessel

Table IV-1. Fate of North Atlantic right whales observed entangled between 2000 and 2011. (Unpublished data compiled by the New England Aquarium)

Status as of last sighting through 2010	No gear removed	Some gear removed	All or most gear removed	Total
Gear free—good condition	21	8	6	35
Gear free—fair or poor condition	4	1	1	6
Entangled—good condition	4	1	-	5
Entangled—fair or poor condition	3	1	1	5
Known or assumed dead	7	1	3	11
Unidentified right whales not resighted	3	-	-	3
Total	42	12	11	65

[2] Whales are assumed to have died if they are not resighted (as confirmed by photo-identification) for six or more years.

operators to avoid hitting them; and that according to records for which vessel speed at the time of the strike was known, the incidence of strikes declines sharply at vessel speeds below 13 knots and strikes become highly unlikely at vessel speeds below 10 knots (Laist et al. 2001). Subsequent analyses have supported those findings (Jensen and Silber 2003; Vanderlaan and Taggart 2006).

With that information, the Service began developing a ship strike strategy in 2004. In part, it included (1) outreach efforts to make mariners aware of the problem and actions they could take to avoid ship strikes on whales, (2) reorienting vessel traffic lanes through right whale habitat to minimize the chances of large vessels encountering whales, and (3) establishing regulations to limit the speed of large vessels (greater than 65 feet in length) to 10 knots or less in times and areas where encounters with right whales were most likely. The rules to limit ship speed were particularly contentious as such measures had never before been developed explicitly to protect large whales. Nevertheless, the Service, to its great credit, adopted a final rule in December 2008. It included seasonal speed restrictions in and around areas designated as right whale critical habitat under the Endangered Species Act, as well as areas off major ports along the species' coastal migratory corridor between the southeastern U.S. calving grounds and New England feeding grounds (Figure IV-4a, b, c).

However, the speed rule generated some controversy and, at the direction of the White House, the final rule stipulated that the speed requirements expire after five years. Before that time, the Service was to analyze the measure's effectiveness and determine if it should be continued, modified, or allowed to lapse. In 2010 and 2011, the Service continued collecting and analyzing relevant data to help make its determination. However, reliably assessing the rule's effectiveness likely will require more than five years of data because the number of documented ship strikes per year is low and variable. That does not mean that the ship rule is unnecessary—the human-caused death of any right whale constitutes an impediment to recovery. At the end of 2011, two observed right whale deaths had been attributed to ship collisions since the rules went into effect in late 2008 (i.e., about 0.67 deaths per year). This is less than half the rate of confirmed vessel-related deaths between 2000 and 2007 when no rules applied (i.e., 14 ship-strike deaths or 1.75 whales per year).

Mitigating Entanglements in fishing gear

Twelve of the 68 confirmed right whale deaths documented since 1990 (i.e., 18 percent) have been attributed to entanglement in commercial fishing gear, mainly lines from lobster traps and gillnets. However, documentation of entanglement-caused deaths may be less likely than documentation of deaths caused by ship strikes. Whales unable to free themselves from gear may deplete their fat reserves before they die, which means that their carcasses are more likely to sink undetected. In addition, some whales may drown after becoming caught in lines and held underwater where their carcasses would not be found. Such deaths are not included with the confirmed deaths shown on Figure IV-2. When these presumed entanglement deaths are added to confirmed deaths from entanglement, the total is comparable to that of observed deaths attributed to ship strikes. That being the case, entanglement also should be considered a major factor slowing population recovery.

To reduce entanglement deaths, the National Marine Fisheries Service has been adopting and revising regulations since the mid-1990s. Those measures are guided by the 1994 amendments to the Marine Mammal Protection Act. To date, the available evidence indicates that the efforts made have not been effective at reducing the number of entangled whales. In fact, that number may be increasing, although the increase could reflect—at least in part—an increase in the number of right whales. The seven known deaths attributed to entanglement in the past six years (2006 through 2011) exceed the total number of such deaths (six) documented in the 20-year period before 2006 (Figure IV-2). In addition, since 2000 the number of whales newly entangled but still alive also has been increasing. Fewer than five

gravity heavier than water) in place of "floating" line to link two or more traps. Floating groundline can form loops extending tens of feet up into the water column between traps and having the potential to entangle passing whales. Sinking line lies flat along the bottom and therefore is thought to reduce entanglement risks significantly. This measure, however, has been controversial because of concern that sinking line will abrade more rapidly on rocks and rough bottoms, leading to the need for more frequent and costly replacement. That concern appears to be warranted in some areas and further work is being undertaken to develop more abrasion-resistant sinking line.

Perhaps the greatest risk of entanglement comes from vertical lines connecting fishing gear resting on the bottom with surface buoys. In 2009 the Service began a five-year rulemaking process to develop new measures to reduce entanglement risks in vertical lines. As it has for the past decade, the Service relies on an Atlantic Large Whale Take Reduction Team to identify such measures. Composed of representatives from relevant fisheries, environmental groups, the scientific community, and state and federal agencies, including the Marine Mammal Commission, the team is charged with recommending consensus measures to reduce the incidental death or serious injury of large whales, including right whales, in trap/pot and gillnet fisheries. The Marine Mammal Protection Act directs that those measures reduce such entanglements to levels below the right whale population's potential biological removal level (i.e., "the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population") within six months of being implemented. Because of its small population size and low rate of reproduction, the current estimate of the potential biological removal level for North Atlantic right whales is less than one whale per year. To date team members have been unable to identify and agree on effective approaches, leaving it to the Service to choose measures based on differing views among team members.

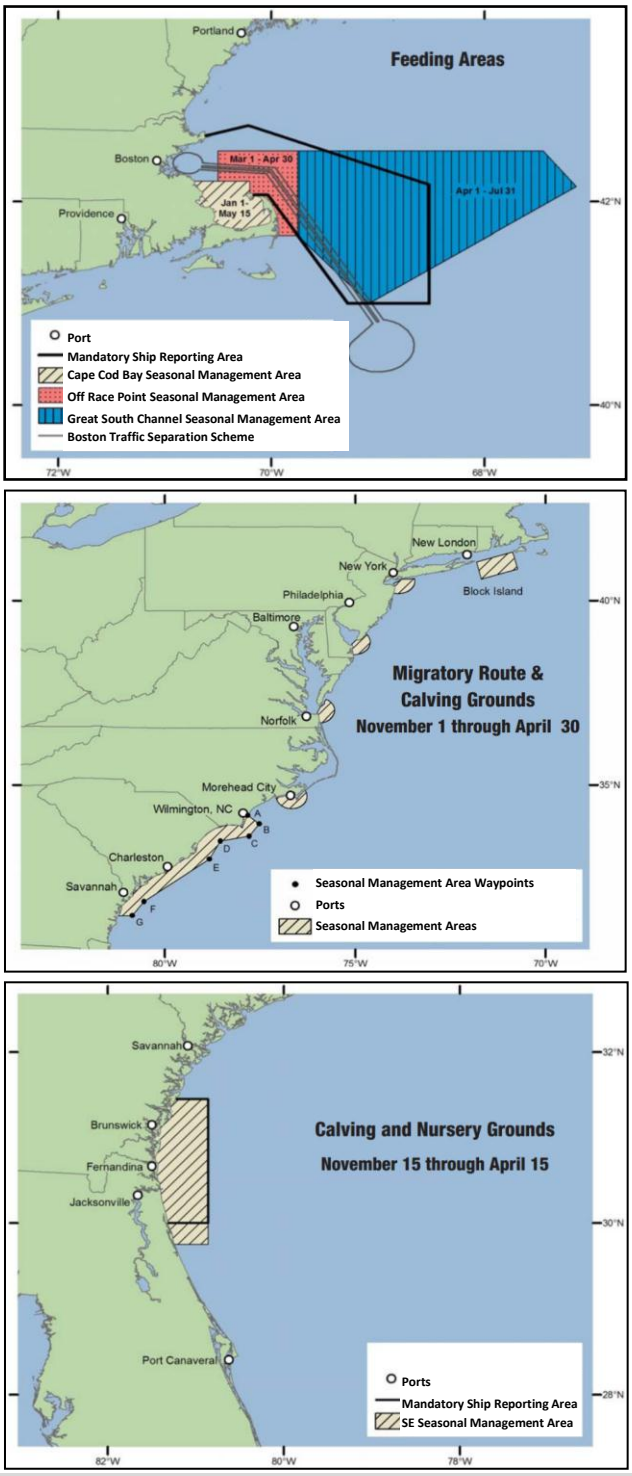

Figure IV-4. Seasonal right whale management areas requiring large vessels (>65 ft) to slow to 10 knots: (a) spring-summer feeding area off Massachusetts, (b) late fall to early spring migratory corridor, and (c) winter calving grounds off southeastern U.S. coast. (Source: National Marine Fisheries Service)

Figure IV-5. This adult female right whale (#2029) was photographed breaching directly beneath an aerial survey plane. It had been seen carrying fishing gear wrapped around its flippers between March 2007 and early 2010 but was able to shed the lines during 2010. Deep indentations and scars from the entanglement are visible at the base of both flippers. (Photo courtesy of Florida Fish and Wildlife Conservation Commission)

To reduce risks of entanglement in vertical lines, the Service has relied largely on a combination of gear modifications thought to reduce the likelihood or severity of entanglements. The result has been a series of rules requiring complex sets of gear modifications such as (1) weak links at various positions on vertical lines and gillnet panels designed to break when whales are entangled, and (2) knotless lines less likely to become caught in whale baleen or on flippers. Given continued and possibly increasing numbers of entangled whales and entanglement-related deaths, those measures appear to have been of limited value. As described in past annual reports, the Commission has questioned their effectiveness and repeatedly recommended a strategy that also includes the removal of gear with hazardous line (i.e., line in the water column and presenting a risk of entanglement) from right whale critical habitat. Except for the recent ban on gillnets in the calving grounds and a seasonal closure for lobster pots in the Great South Channel feeding area off Massachusetts, the Service and fishermen on the Team have rejected any approach that would reduce fishing effort. They also have failed to come up with measures that demonstrably reduce the risk from vertical lines.

In December 2010, the Service reconvened its Atlantic Large Whale Take Reduction Team to continue deliberations on ways to reduce entanglement risks for right whales and other large whales in vertical lines. Instead of focusing primarily on gear modifications, however, the team is now considering ways to reduce the number of vertical lines in the water column. Possible means for doing so include increasing the number of traps per buoy line, establishing caps on the number of buoy lines, and placing seasonal restrictions on vertical lines in high-use right whale habitat. To guide its deliberations and evaluate risk reduction, the team agreed to use a "co-occurrence" model that ranks areas of greatest risk based on the relative density of both whales and fishing gear. In 2010 and early 2011 the team (and a working group consisting of team members) examined the data available for, and the possible use of, such a model. Although the team was unable to agree on specific areas or management measures, several state representatives noted that they would develop measures for consideration at the team's next meeting for areas in which their respective fishermen fish.

On 14 June 2011, the Service announced its intent to prepare an environmental impact statement on new measures under the Atlantic Large Whale Take Reduction Plan to reduce deaths and serious injuries to large whales caused by vertical lines associated with commercial trap, pot, and gillnet fisheries along the U.S. east coast. It requested comments on management options that might be considered and it convened a series of scoping meetings to solicit advice and views from the public and interested agencies and groups on possible management options. On 12 September 2011, the Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, responded to the Service's request. As a general matter, it recommended that the Service give highest priority to mitigation measures for right whales given that their population is far less able to sustain fishery-related deaths and serious injuries than the larger regional populations of humpback whales, fin whales, and other species of concern.

Based on preliminary results of the co-occurrence model, the Commission also noted that 90 percent of the risk of whales encountering vertical lines is in waters off the northeastern United States, principally

in the Gulf of Maine. The Commission therefore recommended that the Service's draft environmental impact statement analyze alternatives for establishing large seasonal management areas off the New England coast including (1) the majority of the southern Gulf of Maine from January through July, (2) the majority of the offshore central Gulf of Maine from October through February, and (3) the small area off northeastern Maine near the edge of U.S. jurisdiction and the Bay of Fundy right whale feeding area from August through September. Within those areas and months, the Commission also recommended that the Service consider a suite of restrictions including closures to any fishing gear with vertical buoy lines, a cap on the number of endlines, a limit of one endline per trap, a minimum number of traps per endline, and a requirement to tend all deployed gillnets with no nets left in the water when vessels return to port.

The Commission also noted that the co-occurrence model calculates entanglement risks for individual ocean blocks (usually 10-minute by 10-minute cells) by multiplying whale sightings per unit of effort and vertical line densities. However, whale sighting effort has been low, and no whales have been sighted during surveys in most areas off the coast of Maine with exceptionally heavy gear density. Thus, model results show a zero entanglement risk for right whales in those areas. Yet, during other times right whales do occur and have been seen, at least occasionally, in those areas and have been entangled in lobster gear set along the Maine coast. Therefore, the Commission recommended that the Service consult with whale biologists on the Atlantic Large Whale Take Reduction Team to (1) find a way to account for those occasional sightings and more accurately estimate rates of occurrence for right, humpback, and fin whales within 20 miles of the Maine coast and (2) use that information in the co-occurrence model to estimate the extent to which vertical lines in those waters contribute to overall entanglement risks for each species.

The Commission also recommended steps to improve information on the source of gear removed from entangled animals and the amount and distribution of vertical lines in use. To improve information on the source of entangling gear, the Commission recommended that the draft environmental impact statement include an analysis of options for new gear marking requirements that would improve the ability of researchers to identify the fisheries, fishing areas, and gear components involved in large whale entanglements. To monitor line reduction goals in managed areas, it also recommended that the draft environmental impact statement identify alternatives to ensure that (1) all trap and gillnet fishermen in state and federal waters record and report in a consistent manner data on the location and number of endlines deployed and the number of traps or nets fished per set and per month, and (2) those data are compiled and analyzed in a timely fashion. Finally, the Commission recommended that the draft statement identify contingency management measures that could be implemented without a new five-year rulemaking process if documented serious injury and mortality levels for right whales or humpback whales exceed potential biological removal levels for two consecutive years.

At the end of 2011, the Service planned to reconvene the Atlantic Large Whale Take Reduction Team to continue deliberations on new ways to reduce the chances of vertical lines entangling right whales and other large whales.

Petition to revise critical habitat for the North Atlantic right whale

In July 2002, the Ocean Conservancy submitted a petition to the National Marine Fisheries Service asking that it revise the boundaries of right whale critical habitat that were initially designated in 1994. The petition was based on new information indicating that the existing critical habitat areas were not sufficient to protect right whales from anthropogenic mortality, and that additional areas were needed to ensure the recovery and survival of the species. In August 2003 the Service published a 12-month determination on the petition (68 Fed. Reg. 51758), finding that the requested revision was not warranted at that time. The Service concluded that, while revising critical habitat boundaries may be a prudent action to take, it was not possible at that time to determine essential biological requirements of the population. It therefore advised that it would continue to analyze the issue based on planned right whale surveys in 2002.

Although the Service conducted various analyses evaluating habitat features critical for right whales, it took no additional action to revise the boundaries, and in September 2009 the Center for Biological Diversity and several other environmental groups submitted a second petition. This petition requested that the Service expand the boundaries of two existing critical habitat areas off Massachusetts and in the southeastern U.S. calving area, and that it also designate as critical habitat waters within 30 nmi of the coast along the species' migratory corridor from South Carolina to Cape Cod, Massachusetts. The Endangered Species Act requires that, within 90 days, the Service determine whether the petition includes information sufficient to warrant a review. If that is the case, then it must determine if the petitioned action is warranted within 12 months. After the Service failed to make its 90-day finding, the petitioners filed a lawsuit on 25 May 2010 alleging that the Service was in violation of requirements for responding to such petitions.

Following a subsequent discussions with the plaintiffs, the Service published a notice on 6 October 2010 (75 Fed. Reg. 61690) announcing a positive 90-day finding. With regard to its 12-month determination on how to proceed with the petition, the agency stated it intended to continue its ongoing rulemaking process with the expectation that a proposed critical habitat rule for the North Atlantic right whale would be submitted to the Federal Register for publication in the second half of 2011. As of the end of 2011, it had not yet done so.

Southern Resident Killer Whale (*Orcinus orca*)

Killer whales inhabit all the world's oceans. At present, they are classified as a single species with no identified subspecies although many scientists consider this monotypic taxonomic structure to be incorrect and in need of revision (Morin et al. 2010 Reeves et al. 2004, Krahn et al. 2004). Killer whales occur in "ecotypes" that can be distinguished genetically and on the basis of color patterns, vocalizations, prey, and foraging behavior. In the northeastern North Pacific Ocean, scientists have identified three ecotypes: a mammal-eating "transient" ecotype that ranges widely in shelf waters along the coasts of Canada and the United States, a fish-eating "offshore" ecotype that occurs principally in pelagic offshore and continental slope waters, and a fish-eating "resident" ecotype that occupies shelf waters and occurs seasonally in specific inshore waters. Although the ranges of different ecotypes overlap, their members rarely, if ever, interbreed, and each typically specializes on exploiting a different segment of the available prey base. Each ecotype may consist of multiple populations with each population composed of one or more pods that form close-knit social groups organized around matrilineal relationships. Scientists have identified at least four populations of the resident ecotype in the northeastern North Pacific Ocean (Krahn et al. 2004). The southern resident killer whale population is one of those and consists of J, K, and L pods. Whales in this population primarily summer in Puget Sound and the adjacent inland waters of Washington state and southern British Columbia where they feed on migrating salmon. From September to May, these whales apparently use coastal waters between British Columbia and central California. Historically, the population is thought to

Figure IV-6. A pod of killer whales is observed by a whale-watching boat in the background (Photo courtesy of Dawn Noren, National Marine Fisheries Service)

have numbered between 140 individuals (based on counts and whales removed from the population) and 200 whales (based on genetic information; 68 Fed. Reg. 31982). Between the late 1960s and early 1970s, about 50 whales were removed for public display and research, and by 1976 the population had declined to about 70 whales. Such removal is no longer permitted in U.S. waters, but the population has not recovered as expected.

Listing Actions

In 2001 the Center for Biological Diversity petitioned the National Marine Fisheries Service to list southern resident killer whales as endangered or threatened under the Endangered Species Act. In 2002 the Service determined that the action was not warranted because the population did not constitute a distinct population segment as defined under the Act. The Service did, however, initiate steps that led to the population's designation as depleted under the Marine Mammal Protection Act in 2003 (68 Fed. Reg. 31980). The Center for Biological Diversity challenged in U.S. District Court the legal basis for not listing the population under the Endangered Species Act, and in 2003 the court instructed the Service to re-evaluate the population's status relative to the Act's definition of a distinct population segment. After doing so, in 2004 the Service proposed that southern resident killer whales be listed as threatened (69 Fed. Reg, 76673), and in 2005, after considering comments on its proposal, adopted a final rule classifying the population as endangered rather than threatened (70 Fed. Reg. 69903). In 2001 Canada's Department of Fisheries and Oceans also designated the southern resident killer whale population as endangered under the Canadian Species at Risk Act (Baird 2001).

Population status in 2011

The Service's 2010 stock assessment report for the southern resident killer whale indicates the population consists of 85 individuals and the draft report for 2011 indicates 86.[3] The major factors that may be impeding recovery of this population are all human-related. Human activities have dramatically reduced the salmon stocks that constitute the prey base for this population. Human activities also have introduced high levels of contaminants into the marine environment (e.g., polychlorinated biphenyls or PCBs and polybrominated diphenyl ethers, a relatively new class of chemicals used in flame retardants), which the whales have accumulated through the food web. Such contaminants may compromise reproductive or immune function. Human disturbance also may be impeding recovery of the southern resident population. The summer range of this population—the inland waters of Washington and British Columbia—is home to a large commercial whale-watching industry as well as high levels of recreational boating and commercial shipping. The presence of these boats and the noise they create may be a significant source of stress for the whales (Ayres et al. 2012). That noise also may mask the whales' communication, resulting in behavioral changes that compromise their ability to forage, reproduce, and survive. The social structure and small population size also put southern resident killer whales at risk from a catastrophic oil spill (e.g., from an oil tanker) that could affect the entire population, particularly in summer months when their pods tend to be in close proximity to each other.

In 2010 the Service announced its intention to conduct a five-year status review of southern resident killer whales (75 Fed. Reg. 17377) and on 17 March 2011 it published the review.[4] The review evaluated progress towards the objective, measurable recovery criteria in the 2008 recovery plan. The review found that the stock was not being over-utilized for commercial, recreational, or educational purposes, but that other recovery factors had not been meet and the stock's status remains inconsistent with that of a healthy,

[3] http://www.nmfs.noaa.gov/pr/sars/species.htm

[4] http://www.nwr.noaa.gov/protected_species/marine_mammals/cetaceans_whales_dolphins_porpoise/toothed_whales/killer_whales/southern_resident_killer_whale/five_year_status_review.html

recovered population. Therefore, the report recommended that the Service retain the population's endangered listing status.

Critical habitat

In November 2006 the National Marine Fisheries Service designated critical habitat for southern resident killer whales, including essentially all of Washington's inland waters with the exception of Hood Canal, 18 military sites, and waters less than 20 feet deep. While this designation covers the primary summer and fall range of the population, no designation was made of critical habitat along the outer coasts of Washington, Oregon or northern and central California, the primary winter and spring range of the population. Those areas were not included because southern resident killer whales are thought to use coastal habitat in the winter but their movements and habitat patterns are poorly known. The Service plans to focus research effort on the investigation of killer whale coastal habitat in the coming years.

Recovery plan development and implementation

In November 2006 the National Marine Fisheries Service circulated a proposed recovery plan for the southern resident killer whale population for public and agency comment (71 Fed. Reg. 69101). On 24 January 2008 the Service finalized the recovery plan (National Marine Fisheries Service 2008) (73 Fed. Reg. 4176), including more specific downlisting and delisting criteria when possible. For example, the Service revised the draft delisting standard pertaining to reproduction to require that each pod include more than two adult males of reproductive age unless available information indicates that one male is sufficient.

In March 2008 Canada's Department of Fisheries and Oceans completed a recovery strategy for the southern resident killer whale population (Fisheries and Oceans Canada 2008). The strategy is complementary to the U.S. recovery plan and focuses on problems relating to prey availability, contaminants, and disturbance.

In 2010 and 2011 the Service initiated, continued, or expanded a range of activities intended to promote recovery of the southern resident killer whale population. Those activities included measures to promote recovery of threatened and endangered runs of salmon that are prey for the whales and various measures to improve ecosystem conditions by reducing contaminants, noise, and disturbance. In February 2011 the Service announced a series of workshops[5] that would be held in collaboration with the Department of Fisheries and Oceans Canada to assess the effects of salmon fisheries on southern resident killer whales. The workshops were designed to engage scientists with a broad range of expertise in a transparent and scientifically rigorous review of all the information available on interactions between Chinook salmon and southern resident killer whales. The first workshop was held 21-23 September 2011, with two more planned for 2012. The Service also developed a killer whale oil spill response plan which is now part of the Northwest Area Contingency Plan that would be used to guide the response to an oil spill in the northwest region.

Vessel interactions

In March 2007 the National Marine Fisheries Service published a request for information regarding regulations or other measures that could be instituted to protect killer whales from significant interactions with vessels (72 Fed. Reg. 13464). During 2008 the Service evaluated the potential impact of such regulations on natural resources (e.g., marine mammals, fish, and the marine ecosystem) and the human environment (e.g., economics, recreation, and transportation). On 29 July 2009 the Service published

[5]http://www.nwr.noaa.gov/protected_species/marine_mammals/cetaceans_whales_dolphins_porpoise/toothed_whales/killer_whales/southern_resident_killer_whale/effects_of_salmon_fisheries_on_southern_resident_killer_whales.html

proposed regulations with a draft environmental assessment. The regulations focused on preventing effects of vessel noise and disturbance on killer whales and reducing the probability of a vessel strike.

In developing its proposed regulations, the Service considered all comments and suggested alternatives from the March 2007 comment request. It then distilled those down to seven possible actions and one proposed action, each of which included 10 common elements. The regulations would—

- apply to all activities in the navigable inland waters of Washington state;
- apply to all killer whales, not just endangered southern residents;
- apply to all vessel operators the harassment or take prohibitions of the Marine Mammal Protection Act and the Endangered Species Act;
- apply to motorized, non-motorized, and self-propelled vessels;
- not apply to federal, state, and local government vessels operating in the course of their official duties;
- not apply to vessels participating in the vessel tracking system;
- not apply to activities, such as scientific research, authorized under permit by the Service;
- not apply to treaty fishing vessels lawfully engaged in actively setting, retrieving, or closely tending fishing gear;
- not apply to any vessel where the operator could prove that a vessel maneuver resulting in a violation was required for safety; and
- not apply to personal use of private vessels in the proposed no-go zone (see below) for access to private property by landowners adjacent to the no-go zone.

The alternative actions considered included the following:

- No-action: The Service would not promulgate any new regulations but would continue the education and outreach program with all of the partners involved in the "Be Whale Wise" education campaign, which includes voluntary guidelines designed to help boaters avoid harassment.
- 100-yard approach regulation: This alternative effectively formalizes "Be Whale Wise" guidelines that advise boaters to stay 100 m (100 yards) away from killer whales.
- 200-yard approach regulation: This alternative would increase the viewing distance suggested in the "Be Whale Wise" guidelines and require boaters to stay 200 yards away from killer whales.
- Protected area: This alternative would establish a proposed protected area equivalent to the current voluntary no-go zone along the west side of San Juan Island. The area would include an 800 m (0.5 mi) wide zone centered on the Lime Kiln lighthouse and a 400 m (0.25 mi) wide zone from Eagle Point to Mitchell Point. The protected area would be enforced 1 May through 30 September.
- An expanded protected area: This alternative would extend the proposed no-go zone 800 m (0.5 mi) offshore from Eagle Point to Mitchell Point and would be enforced 1 May through 30 September.
- Speed limit: This alternative would limit vessel speeds to 7 knots within 400 yards of killer whales.
- Park in the path prohibition: This alternative would require vessels to keep clear of the whales' path, prohibiting vessels from intercepting, placing a vessel in the oncoming path of a killer whale, or positioning a vessel so that wind or currents carry the vessel into the path of the whales.
- Proposed action: This alternative combines three other alternatives, resulting in (1) a 200-yard minimum approach distance, (2) an extended no-go zone on the west side of San Juan Island between 1 May and 30 September, and (3) a prohibition against vessels attempting to intercept whales.

The Service announced an 80-day extension to the public comment period for the proposed rule and draft environmental assessment on 19 October 2009. On 15 January 2010 the Commission commented on the proposed rule and draft environmental assessment. The Commission supported each element of the proposed rule including implementation of a "no-go" zone off the west coast of San Juan Island. The Commission questioned whether the proposed regulations were sufficient to protect the whales from

vessels and recommended several additional measures be considered including (1) establish stand-by zones at some distance beyond the 200-yard approach limit (e.g., beyond 400-600 yards) and limit the number of vessels (e.g., 10) that can be present between that boundary and the 200-yard approach limit at any one time; (2) adopt a regulatory speed limit of either seven knots or, at a minimum, a "slow safe speed" requirement (as defined in 33 U.S.C. § 2006 and the International Regulations for Preventing Collisions at Sea 1972 (see 33 U.S.C. § 1602)) within 400 yards of killer whales; and (3) include the safe operating procedures governing vessel operations in the vicinity of killer whales in the inland waters of Washington state as part of any final rule.

To implement the new regulations the Commission recommended that the Service develop a monitoring plan to assess compliance with and evaluate the effectiveness of the vessel regulations. The Commission also recommended that the Service move quickly to initiate discussions with Canada to develop comparable management strategies for killer whales in the inland waters of British Columbia.

In April of 2011 the Service published a final rule prohibiting vessels from approaching killer whales within 200 yards (182.9 m) and from parking in the path of whales when in inland waters of Washington state (76 Fed. Reg. 20870). The rule exempted vessels actively fishing commercially, cargo vessels travelling in established shipping lanes, and government and research vessels. The final rule does not include a seasonal no-go zone for vessels along the west side of San Juan Island that was in the proposed rule. The Service received extensive comments questioning that measure and decided to continue collecting information and conduct further analysis and public outreach on the concept of a no-go zone for consideration in a future rulemaking. The Service also plans to monitor the effectiveness of the final regulations and consider altering the measures or implementing additional measures if appropriate. The final rule was effective as of 16 May 2011.

Cook Inlet Beluga Whale (*Delphinapterus leucas*)

The Cook Inlet beluga whale stock is one of five beluga stocks that occur in U.S. waters. Its geographical isolation indicates—and mitochondrial DNA analyses confirm—that it is a distinct stock. Unlike other beluga stocks in U.S. waters, the Cook Inlet stock has experienced a significant decline in recent years. Although the stock is believed to have numbered more than 1,300 as recently as the 1970s, it declined rapidly during the 1990s, primarily as a result of overharvesting by Alaska Native subsistence hunters. The current abundance is likely fewer than 400 whales. Because of their proximity to Anchorage, Alaska's largest urban area, beluga whales in Cook Inlet are potentially affected by a variety of human activities. National Marine Fisheries Service analyses of beluga sightings in Cook Inlet over the past 30 years indicate that the stock's summer range has contracted substantially in recent years. Compared with sightings in the 1970s and 1980s, animals are now rarely seen in offshore waters or in the lower reaches of the inlet. In June, when the Service conducts aerial surveys of the stock, beluga whales generally are concentrated in a few groups in the inlet's upper reaches around the Susitna River delta, Knik Arm, Turnagain Arm, and Chickaloon Bay.

Endangered Species Act listing

On 31 May 2000 the National Marine Fisheries Service designated the Cook Inlet beluga whale stock as depleted under the Marine Mammal Protection Act. At that time, the Service declined to list the stock under the Endangered Species Act, primarily because it believed that overharvesting by subsistence hunters was the primary threat to the stock and had been adequately addressed. That being the case, the Service did not consider the stock to be at risk of extinction and expected it to recover. Contrary to the Service's expectations, the stock did not increase after harvest regulations were established in 1999. Instead, it appears to have continued its decline despite the fact that subsistence hunters are reported to have taken only five whales in the past decade. A recent analysis of data from abundance surveys by the

National Marine Fisheries Service (2011) indicates that the stock has declined by an average of 1.1 percent per year since 2000. Figure IV-7 illustrates the stock's trend from 1994, when the Service instituted its monitoring program, to 2011.

In light of the observed stock trend and unanswered questions about the cause or causes of the decline, the Marine Mammal Commission wrote to the National Marine Fisheries Service on 24 April 2006 and recommended that the Service reconsider listing the stock under the Endangered Species Act. The Commission noted that the abundance of Cook Inlet beluga whales is about the same as the abundance of the North Atlantic right whale, which is considered highly endangered. The Commission also pointed to a recent IUCN Red List assessment of the Cook Inlet beluga whale stock, which concluded that it qualified as "critically endangered" under the applicable IUCN criteria (Lowry et al. 2006). In addition, the Commission recommended that the Service expedite publication of a proposed listing determination rather than going through the intermediate step of preparing a new status review. In fact, the Commission recommended that the Service consider using the emergency listing provisions of the Endangered Species Act as an interim measure. The Commission also emphasized the urgent need to fund an expanded research program to investigate the factors affecting the stock and identify and implement appropriate recovery measures.

The Service published a proposed rule to list the Cook Inlet beluga as an endangered species on 20 April 2007 (72 Fed. Reg. 19854). However, it declined to use expedited procedures and, instead, invoked a provision of the Endangered Species Act to extend the decision-making deadline by six months. The Service sought the extra time to (1) consider comments from the state of Alaska questioning the sufficiency of the available data and (2) allow it to evaluate the results of the 2008 abundance survey. The Commission responded by writing to the Secretary of Commerce recommending that the agency withdraw the six-month extension and proceed immediately with listing the Cook Inlet beluga whale stock as endangered. The Commission noted that the purported disagreement over the stock trend was not scientifically credible, and it disputed the notion that the 2008 stock estimate might somehow change the conclusions about the stock trend that supported listing.

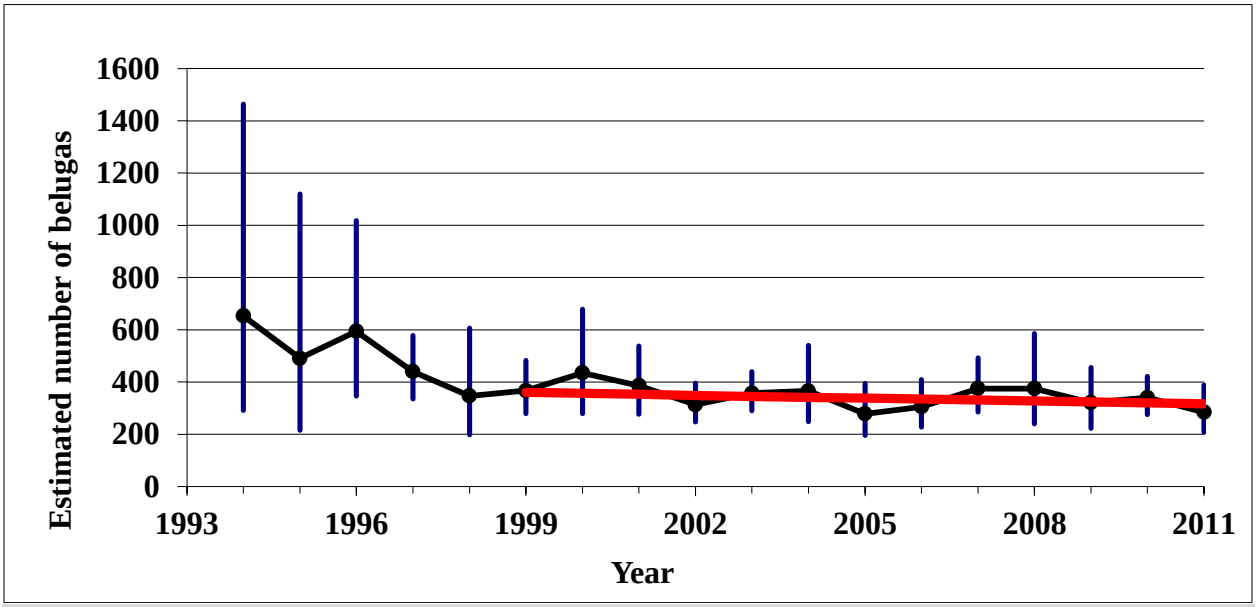

Figure IV-7. Abundance estimates of beluga whales in Cook Inlet, Alaska 1994-2010. Error bars depict 95 percent confidence intervals. Rate of decline from 2000-2010 (red trend line) has been -1.3% per year. (Figure source: R. Hobbs, National Marine Fisheries Service)

As the Commission had expected, the 2008 abundance estimate had little effect on conclusions regarding the population trend. The likelihood that the stock was continuing to decline dropped from 65 to 62 percent. The estimated likelihood that the stock would go extinct within 100 years remained at 26 percent, and, applying the model it considered most realistic, the Service concluded that the probability of extinction within 300 years was 70 percent.

On 22 October 2008 the Service published a final rule listing the Cook Inlet beluga as an endangered species. The final rule indicated that the Service intended to designate critical habitat for the stock in a separate rulemaking because it did not have sufficient information to determine such habitat for the species, as described below.

Litigation

Section 11(g)(2) of the Endangered Species Act requires those seeking to challenge an agency action for an alleged violation of the Act to provide written notice at least 60 days prior to filing a lawsuit. On 12 January 2009 Alaska's attorney general wrote to the Secretary of Commerce and the head of the National Marine Fisheries Service indicating the state's intention to file a suit challenging the listing of the Cook Inlet beluga whale stock. The state cited several alleged violations, including the Service's failure to (1) properly consider conservation practices and protection measures being taken in Alaska, (2) respond adequately to the state's comments on the proposed rule, (3) document sufficiently its basis for determining the Cook Inlet stock of beluga whales to be a distinct population segment of the species eligible for listing, and (4) provide an additional opportunity for public review and comment of documents and data relied on in the final listing rule but not available at the time the proposed rule was published. At the end of 2009 the state of Alaska had yet to file a lawsuit challenging the listing decision but indicated that it still intended to do so.

On 4 June 2010 the state filed its lawsuit in federal court. It asked for declaratory and injunctive relief under the Administrative Procedure Act and the Endangered Species Act, and requested that the court vacate the Service's listing decision (*Alaska* v. *Lubchenco* 2011). The state alleged that the Service failed to consider the relevant statutory factors and did not conform to the requirements for making a listing determination. On 7 September 2010, the court allowed two additional parties, Escopeta Oil Company, LLC, and the Alaska Center for the Environment (including several other nonprofit corporations) to intervene in the case as plaintiff and defendant, respectively. In its deliberation, the court noted that judicial review of agency decisions under the Endangered Species Act is governed by strict limitations within the Administrative Procedure Act—a court may set aside an agency action only if it can be demonstrated "as arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law" 5 U.S.C. 706(2)(A). The court therefore may not substitute its own judgment for the agency, but instead must determine whether the agency considered relevant factors and established a clear rational link between these factors and the decisions made. After reviewing the case, the court issued a final opinion on 21 November 2011. In its opinion, the court found that the Service rationally considered all the relevant listing factors under the Endangered Species Act, based its decision on the best available scientific data, and provided full opportunity for public comment. The judge ruled in favor of the defendants, upholding the Service's listing decision.

Critical habitat

Section 4(b)(6)(C) of the Endangered Species Act requires that critical habitat be designated concurrent with publication of an endangered or threatened listing determination except in certain circumstances. If the agency responsible for the listing finds that critical habitat for the species "is not then determinable," it has one additional year to complete the designation process. In its 22 October 2008 final listing rule, the National Marine Fisheries Service indicated that it did not have sufficient information on the "primary constituent elements" of Cook Inlet beluga whale habitat or on the possible economic consequences of designating certain areas as critical habitat. The Service therefore concluded

that it could not determine critical habitat and indicated its intention to designate critical habitat in a separate rulemaking.

Critical habitat is defined under the Endangered Species Act as specific areas occupied by the species at the time it is listed that include physical or biological features (1) essential to the conservation of the species and (2) that may require special management considerations or protection. Areas outside the current range of the species also qualify for designation as critical habitat if such areas are determined to be essential for conservation of the species. The Service must consider the economic impact of a critical habitat designation and may exclude certain areas if it determines that the benefits of the exclusion outweigh the benefits of including those areas in the designation. The Service published an advance notice of proposed rulemaking on 14 April 2009 (74 Fed. Reg. 17131) seeking information needed to make those determinations. The Marine Mammal Commission provided comments to the Service regarding its advanced notice of proposed rulemaking. The reader can find a summary of those comments in the Commission's 2009 annual report.

The Service prepared a draft economic assessment to evaluate the impact of designating the proposed areas as critical habitat as part of a cost-benefit analysis.[6] The assessment notes that the regulatory impact of a critical habitat designation is confined largely to triggering review under section 7 of the Endangered Species Act, which mandates that federal actions (i.e., those actions authorized, funded, or carried out by a federal agency) not result in the destruction or adverse modification of critical habitat. However, section 7 review also is prompted by virtue of listing a species as endangered or threatened, requiring federal agencies to ensure that federal actions are not likely to jeopardize the continued existence of any listed species. The economic assessment observed that most actions that would adversely modify or destroy critical habitat also would violate the jeopardy prong of section 7. Therefore, the possible economic impact of a critical habitat designation (e.g., by preventing a project from going forward or requiring changes in a proposed action) should be viewed in terms of the incremental impact of the critical habitat review over and above that already required to determine whether an action would jeopardize the species. When viewed in that context, the Service concluded that the potential economic impact of a critical habitat designation was relatively modest. On the other hand, the Service determined that considerable benefits would accrue from designating critical habitat, not only in the context of section 7 but by providing public notice of areas and features important to species conservation. The Service also observed that a critical habitat designation may result in other ancillary benefits such as improving the ecological functioning of the Cook Inlet ecosystem or allowing more opportunities for whale-watching activities. Consistent with its notice of proposed rulemaking, the Service did not propose excluding any areas from the identified critical habitat based on economic considerations. However, the Service proposed to exclude from the designation any manmade structures that exist as of the date that a final designation becomes effective as well as the land on which such structures rest.

The Service also proposed excluding two areas under a separate provision of the Endangered Species Act. Section 4(a)(3)(B)(i) of the Act directs the Service not to designate as critical habitat any lands or other areas owned or controlled by the Department of Defense or designated for the Department's use if those areas are subject to an integrated natural resources management plan prepared under the Sikes Act and that plan provides benefits to the species for which critical habitat is being designated. Under that provision the Service proposed excluding areas within Elmendorf Air Force Base and Fort Richardson's Eagle River Flats live fire range from the critical habitat designation. The Port of Anchorage had sought a similar exclusion based on its designation by the Army as a Strategic Military Seaport, but the Service declined to include such an exclusion in its proposed rule pending receipt of additional information.

On 2 December 2009 the Service published a proposed rule to designate critical habitat for Cook Inlet beluga whales (74 Fed. Reg. 63080). The proposed rule included two adjacent areas within Cook Inlet as critical habitat (see Figure IV-8). The first area includes 1,918 km^2 (741 mi^2) in the northernmost portion of the Inlet—the area northeast of a line from the mouth of Threemile Creek to Point Possession, including the Susitna River delta, Chickaloon Bay, Turnagain Arm, and Knik Arm. This area contains

[6] alaskafisheries.noaa.gov/protectedresources/whales/beluga/chabitat/cib_economicanalysis0810.pdf

shallow tidal flats, river mouths, and estuarine habitat that are particularly important for foraging and as nursery sites. The second area includes all waters south of the first area to 60° 25′ N latitude, nearshore areas south of 60° 25′ N latitude along the west side of the inlet, and Kachemak Bay, near Homer, on the east side of the lower inlet. This area of 5,891 km^2 (2,275 mi^2) is of lesser importance during the spring and summer but provides important feeding and transit areas in the fall and winter. The Service did not include any habitat outside the areas currently inhabited by beluga whales in the proposed designation "because any such areas are presently unknown … and the value of any such habitat in conserving this species cannot be determined." However, it did not address the question of whether the current range of Cook Inlet beluga whales, which has contracted as the stock has declined, would be sufficient to support recovery.

On 3 March 2010 the Commission provided comments on the proposed rule to designate critical habitat for the endangered Cook Inlet beluga whale stock. The Commission noted that it had provided recommendations to the Service concerning critical habitat designation in 2007 and 2009. As reflected in those letters, the Commission reiterated its belief that the designation of critical habitat for Cook Inlet beluga whales is one of the most important actions that can be taken to prevent the extinction of the stock, and encouraged the Service to complete the action as soon as possible. The Commission recommended that the Service adopt its proposal to designate all waters and coastal areas of Cook Inlet used by beluga whales north of 60° 25′ N latitude as critical habitat. In addition, the Commission recommended the Service (1) expand designation farther from shore to include all waters less than 18 meters in depth in the remaining portion of the inlet as critical habitat, including all such waters on the eastern side of the inlet; (2) also include areas in the lower portion of the inlet that must be available for reoccupation if and when the stock increases; (3) adopt a precautionary approach by declining to exercise its discretion to exclude any proposed critical habitat based on economic considerations; and (4) provide Fort Richardson's integrated natural resources management plan to the public and, in the final rule, explain the basis for its conclusion that the plan provides benefits to the Cook Inlet beluga whale stock.

On 11 April 2011 the Service published a final rule designating habitat for the Cook Inlet beluga whale (76 Fed. Reg. 20180). The Service designated the two areas consistent with its earlier proposed critical habitat, with the final designation comprising a total of 7,804 km^2 (3,013mi^2) of marine habitat. In its final decision, the Service ultimately decided to exclude the Port of Anchorage from its critical habitat designation in consideration of national security interests. Although the Department of Defense did not make a request to exempt the Port of Anchorage, the Department has named the port as one of 19 strategic ports in the nation, asserting its strategic importance for military readiness. These factors formed the basis for the Service's final decision, which concluded that the benefits of excluding the port for national security reasons outweighed the conservation benefits of including the port. Additionally, the Service excluded portions of the Eagle River Flats Range on Fort Richardson and military lands of Joint Base Elmendorf-Richardson because it believed that the military was providing sufficient conservation benefits through its integrated natural resource management plan. Figure IV-8 depicts the final critical habitat designation for the Cook Inlet beluga whale stock.

Development of a recovery plan

On 22 October 2008, the same day that the Service published the final rule listing the Cook Inlet beluga whale as an endangered species, it published a notice of availability of the final conservation plan under the Marine Mammal Protection Act.[7] Once a species is listed under the Endangered Species Act, the Service is required to prepare a recovery plan (unless it determines that such a plan will not promote the conservation of the species). The Service indicated in its listing rule that it did, in fact, intend to prepare a recovery plan for the Cook Inlet beluga whale stock. Because conservation and recovery plans

[7] http://www.nmfs.noaa.gov/pr/pdfs/species/belugawhale_conservationplan.pdf

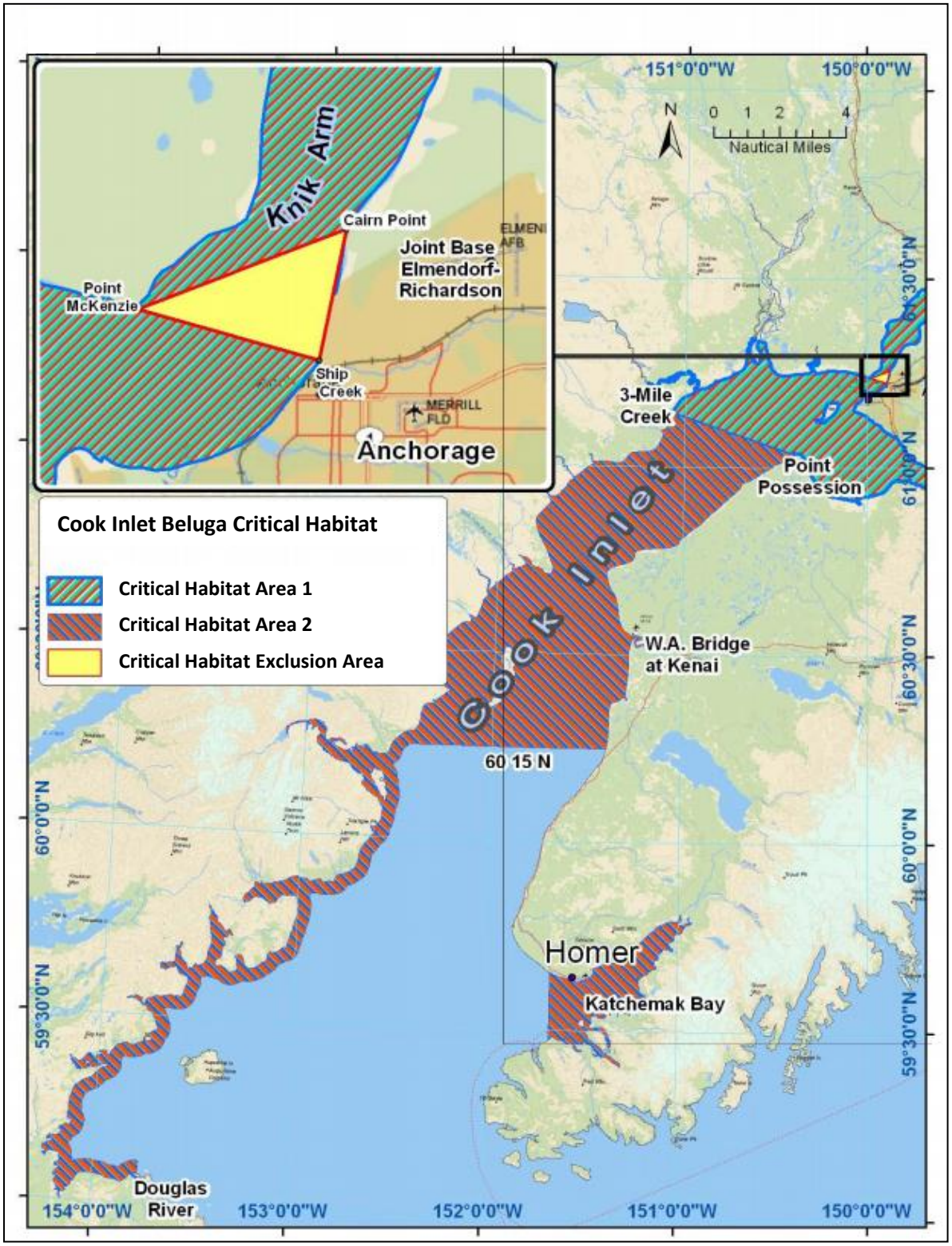

Figure IV-8. The National Marine Fisheries Service has announced a final decision to designate two adjacent areas as beluga whale critical habitat. Area 1 is particularly important for foraging and as nursery sites. Area 2 provides important feeding and transit areas in the fall and winter. An exclusion area was created for the Port of Anchorage for security reasons. (Map source: National Marine Fisheries Service)

are prepared for similar purposes, the conservation plan presumably will provide the starting point for preparation of the recovery plan.

Section 4(f) of the Endangered Species Act governs the development and implementation of recovery plans for the conservation and survival of each listed species. A plan should include (1) a description of site-specific management actions necessary to meet the recovery goal, (2) objective, measurable criteria that, when met, would warrant de-listing, and (3) estimates of the time required and the costs associated with carrying out the measures needed to achieve the plan's recovery goal and intermediate steps toward that goal.

Section 4(f) also authorizes the Service to establish a recovery team consisting of public and private agencies and institutions and other qualified persons to assist in the development of a recovery plan. On 28 January 2010 the Service issued a notice announcing its intent to prepare a recovery plan and soliciting information on Cook Inlet beluga whales and their habitats for the purpose of preparing the plan (75 Fed. Reg. 4528). On 29 March 2010 the Commission responded, noting the plan was needed because of the uncertainty regarding the risk factors that may be impeding recovery of the stock and the measures needed to address those factors. The Commission recommended that the Service use its 2008 conservation plan as a template for developing the recovery plan, and as a guide for the Service's research and management efforts until the recovery plan was completed. The Commission also noted that, over the preceding two decades, the Service had taken no substantial steps to establish a research program, nor had it taken any management actions to address the stock's poor status and need for protection. The Commission offered to help the Service elevate the priority of developing an appropriate research and recovery plan.

On 30 March 2010 the Service convened for the first time the Cook Inlet Beluga Whale Recovery Team. Since then, the team met in September and December 2010; its science panel met in April 2011; and its stakeholder panel met in November 2011. The team's sole focus has been the development of a recovery plan.

On 28 June 2010 the Commission wrote the Service requesting a summary indicating (1) how much funding it allocated for Cook Inlet beluga whale research for fiscal years 2006 through 2010, (2) what research and recovery projects were undertaken in each of those years and the approximate cost of each, (3) how other funds designated for Cook Inlet beluga recovery have been used, and (4) planned research and recovery activities and their anticipated costs for fiscal years 2011 through 2013. The Service responded to the Commission's request with detailed data on research projects and funding for the requested years. The Service noted that research funding has been variable during that period and peaked at just over $2M in 2007.

On 10 May 2010 the Service released a Cook Inlet beluga whale research plan outlining a structured research approach with prioritized actions aimed at understanding and reversing factors causing the decline. On 3 October 2011, the Commission wrote to the Service to recommend that it (1) continue photo-identification work for long-term monitoring and expand that work, as appropriate, to help identify the factors that are impeding stock growth; (2) convene a group of experts in biopsy sampling methods to weigh the risks and benefits of such research and consider how it might best be structured and coordinated; (3) expand its efforts to respond to beluga strandings to assist live-stranded whales and collect comprehensive samples from beach-cast dead animals; and (4) continue to fund aerial surveys on an annual basis. The Service responded on 7 November 2011, agreeing for the most part with the prioritized research activities, including the importance of photo-identification work and convening a group of experts to review research techniques prior to committing to large-scale biopsy sampling. Although the Service agreed with the Commission's recommendations in general, it noted the need to consider practical constraints on such efforts, most notably the costs associated with the recommended activities.

In 2011, the Commission was copied on a letter from the leader of the Cook Inlet Beluga Whale Recovery Team, citing concern over the scientific independence of some of its state representatives. Specifically, the letter highlighted concerns that some state scientists on the team were being required to represent the state's policy positions in the team's deliberations rather than providing their own

independent, scientific perspectives. The Commission wrote to the Service on 21 January and 7 March, 2011, expressing concern over this issue. Discussions between the state and the Service indicated the state was not willing to allow these scientists to participate independently and the Commission recommended the Service dismiss the two state members from the team to maintain its scientific integrity. The Service did so in a manner consistent with national guidance set forth by the White House Office of Science and Technology Policy on the importance of scientific integrity in all federal agency actions (76 Fed. Reg. 36094).

Regulation of subsistence hunting

Section 101(b) of the Marine Mammal Protection Act allows Alaska Natives to take marine mammals for subsistence purposes or for making and selling handicrafts, provided that the taking is not done in a wasteful manner. Other limits may be placed on such taking only through formal rulemaking and only if a stock has been designated as depleted or is considered depleted by virtue of being listed as endangered or threatened under the Endangered Species Act. Estimates derived from a variety of sources indicate that high levels of subsistence hunting of Cook Inlet beluga whales occurred throughout much of the 1990s and were a major cause of the stock's decline. The overharvest and precipitous decline of the stock led to a number of actions to limit hunting, prevent further decline, and promote the stock's recovery. Those actions culminated in the publication of final harvest regulations on 15 October 2008 (73 Fed. Reg. 60976).

The key component of the regulations is a harvest table that sets forth the allowable harvest of Cook Inlet beluga whales according to estimated abundance levels and growth rates, and subject to adjustments based on whether observed mortality from sources other than subsistence hunting exceeds the expected number of deaths for a stock of its size. No harvest is allowed if the average stock estimate over the previous five-year interval is less than 350. Once the average reaches 350, a limited number of strikes would be allowed (e.g., one strike per year under a low or intermediate growth rate). The number of allowed strikes would increase under other scenarios to a maximum of 32 strikes over five years at a stock of 700 or greater if the stock is experiencing a high growth rate. The regulations are codified at 50 C.F.R. § 216.23(f)(2)(v). Because the average abundance estimate over the previous five years was below 350, harvesting is not allowed for the years 2008 through 2012, and none is known to have occurred from 2008 to 2011.

Incidental take and the Knik Arm bridge

The Marine Mammal Protection Act prohibits the unauthorized taking of any marine mammal. Activities other than commercial fishing that incidentally take marine mammals, including Cook Inlet beluga whales, generally require an authorization under section 101(a)(5) of the Act. In addition, now that the Cook Inlet beluga whale is listed as an endangered species, activities that may take these whales are subject to consultation under section 7 of the Endangered Species Act. During 2010 and 2011, as in previous years, the Commission provided recommendations on a number of activities that could take Cook Inlet beluga whales incidentally, including military exercises, underwater seismic activity, and coastal development projects. The Commission's recommendations can be found in Appendix A of this report. The following highlights Commission concerns regarding an ongoing proposal to build a bridge across the Knik Arm in upper Cook Inlet.

The state of Alaska established the Knik Arm Bridge and Toll Authority in 2003 for the purpose of overseeing construction of the proposed bridge, which would connect the municipality of Anchorage with the Mat-Su Borough. In September 2006 the bridge authority, in conjunction with the Federal Highway Administration, published a draft environmental impact statement under the National Environmental Policy Act to consider alternatives for the proposed bridge project and their impacts. The Commission's comments on the impact statement questioned the conclusion that the proposed bridge construction and

operation would not have significant effects on Cook Inlet beluga whales. The statement had identified most of the possible sources of impact, including disturbance from construction activities, increased vessel operations, and increased human use of the Knik Arm area; masking of sounds used by beluga whales for communication, navigation, and predator avoidance; alteration of habitat-use patterns, particularly in transit corridors into and out of Knik Arm; changes in the distribution and abundance of prey; and increased risk of strandings. Nevertheless, the Commission believed that the impact statement had erroneously discounted the significance of these potential effects. The Commission found the statement's assessment of possible cumulative impacts to be especially wanting, particularly in light of the fact that the beluga whale stock seems to be experiencing an ongoing decline for undetermined causes, even in the absence of the additional stressors likely to result from construction and operation of the bridge.

In August 2006 the National Marine Fisheries Service published a notice announcing receipt of an application from the Knik Arm Bridge and Toll Authority seeking an incidental take authorization under the Marine Mammal Protection Act for the proposed bridge construction (71 Fed. Reg. 49433). The Commission commented on 22 September 2006 recommending, among other things, that a rulemaking to issue the requested authorization be deferred until the Service could, with reasonable confidence, support a conclusion that those activities would have no more than a negligible impact on the Cook Inlet beluga whale stock. On 12 March 2009, before the Service had either denied the application or published a proposed rule to authorize incidental taking, the bridge authority wrote to the Service withdrawing its application.

On 8 September 2010 the Service published another notice announcing receipt of a revised incidental take application from the Knik Arm Bridge and Toll Authority in conjunction with the Department of Transportation's Federal Highway Administration (75 Fed. Reg. 54599). The applicants were seeking authorization under section 101(a)(5)(A) of the Marine Mammal Protection Act to take small numbers of beluga whales, harbor seals, and harbor porpoises incidental to construction of the Knik Arm Bridge from spring 2013 through autumn 2017. The Commission commented on 7 October 2010, recommending that the National Marine Fisheries Service require the applicants to—

- clarify how source levels of the impact and vibratory hammers were determined;
- obtain and verify source level and propagation loss data for large-diameter, drilled-shaft construction methods using an oscillator and use that information to estimate the expected number of takes;
- fully describe the process and data used to estimate propagation loss, associated distances to Level A and B harassment thresholds, and the number of takes;
- verify the timing of the proposed in-water construction activities;
- clarify how those takes reflect variations in the activities that would be conducted and the seasonal distribution of marine mammals near the project site;
- provide marine mammal density estimates and estimated takes during those months currently not addressed in the application; and
- explain how activities would be adjusted during the construction period to take into account the observed distribution, movements, and behavior of beluga whales.

The Commission also recommended that, if the Service were to propose regulations for the planned bridge construction activities without better data, it—

- incorporate safety zones with added precautionary buffers for use with
- the impact and vibratory hammers until in-situ measurements have been made and estimated sound pressure levels have been verified;
- apply the same proposed safety zones associated with use of the vibratory hammer to use of the oscillator;

- resolve the uncertainty associated with the qualifiers "when possible and practicable" and "when weather and daylight hours permit" and structure the proposed rule to prohibit in-water activities at times and under conditions when the specified mitigation and monitoring measures are not being implemented or are not expected to be effective;
- require that observations be made before, during, and after all soft-starts of pile-driving and pile-removal activities to gather the data needed to analyze the effectiveness of this technique as a mitigation measure and require the applicants to analyze and report their findings as part of the monitoring and reporting requirements; and
- condition the proposed rule and any letter of authorization issued thereunder to require suspension of the construction activities if a marine mammal is seriously injured or killed and the injury or death could be associated with those activities and, if supplementary measures are unlikely to reduce this risk to a negligible level, require the applicants to suspend their activities until an authorization for such taking has been obtained.

The Service had not issued the proposed rule by the end of 2011. To the Commission's knowledge, it also had not initiated section 7 consultation under the Endangered Species Act.

False Killer Whale (*Pseudorca crassidens*)

False killer whales are found in tropical and subtropical oceans around the world. They are among the larger delphinids and can grow to lengths of five to six meters (16 to 20 ft) and can weigh up to 1,200 kg (2,645 lb). Their outward appearance bears little resemblance to killer whales (*Orcinus orca*); they were given the name *Pseudorca* due to similarities in the skulls and teeth. False killer whales are highly social and occur in relatively discrete, but often overlapping, regional populations of several hundred to well over 1,000 animals. They are upper trophic level predators and thus are naturally rare. They usually hunt for prey in relatively small subgroups and feed primarily on large pelagic fishes, such as tuna, mahimahi, wahoo, and pomfret. Several populations occur at least partially within the U.S. Exclusive Economic Zone around Hawaii and other territories in the central and western Pacific Ocean.

Because they usually occur far from shore, false killer whales are relatively unstudied and poorly known, particularly with regard to their population structure, range, and movements. However, recent genetic, photo-identification, and telemetry studies have identified at least four relatively discrete populations in U.S. waters of the Pacific. These include (1) the Hawaii pelagic population found mostly beyond 140 km offshore (i.e., within and beyond the U.S. Exclusive Economic Zone around the Hawaiian Archipelago), (2) the Hawaii insular population occurring mostly within about 90 km of the Main Hawaiian Islands (MHI), (3) a population around Palmyra Atoll about 1,000 miles southwest of Hawaii (Chivers et al. 2007, 2008, 2010; Baird et al. 2008a, 2010; and Baird 2009), and (4) a fourth population around American Samoa about 1,500 miles farther southwest of Palmyra Atoll. The best estimates of abundance for these populations available through 2011 are 484 whales for that portion of the Hawaii pelagic population within the U.S. Exclusive Economic Zone (Carretta et al. 2010), about 150 whales for the Hawaii insular population (Oleson et al. 2010; Baird unpublished), and 1,329 whales for the Palmyra population (Carretta et al. 2010). Existing information is not sufficient to estimate the abundance of the American Samoa population. Further research is likely to identify additional populations in other U.S. Pacific waters. For example, recent genetic, photo-ID and telemetry data also suggest a separate insular population of false killer whales in the nearshore waters around the Northwestern Hawaiian Islands (Baird et al. 2011; Martien et al. 2011).

Fishery interactions

False killer whales are often attracted to longline fishing vessels and they are the species of cetacean most frequently involved in taking or "depredating" bait and hooked fish, as well as the most frequently recorded caught on hooks or entangled in fishing lines in the Hawaii-based longline fishery. Such interactions are a significant conservation issue for at least the Hawaii pelagic population and are an important management issue for commercial longline fisheries off Hawaii. Rates of bycatch (serious injury and mortality) in the Hawaii-based longline fishery have exceeded the Potential Biological Removal (PBR) levels estimated for false killer whales in Hawaii since data were first available to estimate bycatch rates and PBR. To reduce this bycatch, the National Marine Fisheries Service established a take reduction team in 2010. The team reached consensus on a draft take reduction plan that included both regulatory and non-regulatory elements, and the Service published a proposed take reduction plan in July 2011 (see Chapter VIII**)**.

Listing under the Endangered Species Act

The National Marine Fisheries Service also is considering whether to list the Hawaii insular stock as endangered or threatened under the Endangered Species Act. On 1 October 2009 the Natural Resources Defense Council petitioned the Service to list the population based on its unique position as the species' only known false killer whale population living in close association with an island ecosystem, its small size, evidence that it has declined significantly in abundance over the past 20 years, and threats from longline fisheries, pollution, and random events that have a greater chance of affecting small populations.

On 5 January 2010 the Service published a notice (75 Fed. Reg. 316) that it had received the petition and concluded that the listing action may be warranted. It therefore provided notice that it would review the status of the population and requested comments and information to inform the review. Under a policy adopted by the Service to make Endangered Species Act listing decisions for populations as opposed to entire species,[8] three standards must be met to proceed with listing: the population must be a discrete population unit, it must be ecologically or evolutionarily significant to the species, and it must satisfy at least one of five listing criteria in the Act.

On 5 February 2010 the Marine Mammal Commission wrote to the Service in response to the request for information and transmitted a recently completed contract report reviewing scientific information on false killer whales in Hawaii (Baird 2009). In its letter the Commission noted that it believed the Hawaii insular population met each listing standard under the Endangered Species Act and expressed support for the Service's plan to proceed with the status review. With regard to discreteness, the Commission noted that recent photo-identification studies indicate that false killer whales within about 90 km of shore do not mix with those found farther offshore (Baird 2009). Moreover, genetic studies also indicate that insular false killer whales are demographically isolated (Chivers et al. 2007, 2008, 2010). However, those analyses were based on limited sample sizes and the Commission recommended that the Service (1) ensure that, whenever possible, longline fishery observers collect samples from false killer whales that have been caught incidentally in Hawaiian waters and expedite genetic analyses of those samples and (2) use all available photo-identification records to evaluate associations among individual false killer whales in Hawaii to provide a more powerful assessment of the likelihood of interbreeding between pelagic and insular populations. If those further analyses could not be completed within the timeframe of the status review, the Commission recommended that the Service err on the side of caution by assuming that the insular and pelagic populations are discrete unless it could make a strong case that they are part of a single interbreeding population.

With respect to significance, the Commission noted that the Hawaii insular population appeared to be genetically distinct from other populations and that it was the taxon's only known insular population. It also noted that the insular population was a top predator in an ecosystem that itself is unique. As such, the

[8] http://www.nmfs.noaa.gov/pr/laws/esa/policies.htm

insular population appeared to satisfy several criteria for evaluating significance and the Commission recommended that the Service either find the population to be a significant ecological and genetic component of the species, or provide a rationale for why the only known insular population of false killer whales in U.S. waters should not be considered significant to the species.

Figure IV-9. A false killer whale hooked on a fishing line (Photo courtesy of Eric Forney, National Marine Fisheries Service)

Finally, with regard to conservation factors, the Commission noted that available survey data indicate that the insular population has declined significantly over the past two decades (Baird et al. 2008b; Mobley 2004). Aerial surveys in June of 1989 recorded multiple sightings of individual false killer whale groups in excess of 300 whales (Reeves et al. 2009), each of which was several times greater than the current total population estimate. It also noted that existing information is not yet sufficient to confirm the cause of the apparent population decline, but evidence of interactions with longline fisheries (e.g., photographs of dorsal fins of whales from the insular stock with scars consistent with those known to be caused by longlines) provides a reasonable basis for concluding that such interactions may have caused the injury or death of at least some whales and may have been and may continue to be a factor contributing to the decline (Figure IV-9). To date, the Service has collected little information documenting interactions with longline-type fisheries known to occur within the population's range (e.g., the Hawaii-based shortline and kaka fisheries). Therefore, the Commission also recommended that the Service include the shortline, kaka, and other fisheries likely to take insular false killer whales within the scope of the Hawaiian False Killer Whale Take Reduction Team.

The status review was released in August 2010 (Oleson et al. 2010) and on 17 November 2010 the Service published a notice (75 Fed. Reg. 70169) that it was proposing to list the Hawaiian insular false killer whale as an endangered distinct population segment under the Endangered Species Act. At the time of the proposed listing the Service did not propose designation of Critical Habitat, but did request information relevant to determination of critical habitat. Due to the scarcity of information at that time about the population's behavior and habitat-use patterns, the Commission could not provide the Service with recommendations on particular locations that may be essential for the population. However, the Commission recommended the best way for the Service to assess such areas likely would be through examination of recent false killer whale satellite tracking studies. The Commission also recommended the Service refer to a 2009 Commission-funded study entitled "A Review of False Killer Whales in Hawaiian Waters: Biology, Status and Risk Factors" for relevant information.[9]

Hawaiian Monk Seal (*Monachus schauinslandi*)

The recovery of the Hawaiian monk seal is one of the nation's most critical marine mammal conservation issues. The Hawaiian monk seal is listed as endangered under the Endangered Species Act. It now numbers about 1,200 animals and is declining at a rate of about 4 percent per year. About 80 percent of all

[9] http://www.mmc.gov/reports/workshop/pdf/killerwhale_review_mmc09.pdf

monk seals currently live in the remote Northwestern Hawaiian Islands (Figure IV-10). From the 1950s to the 1970s virtually all seals were found in the NWHI where the principal cause of its decline was human disturbance, particularly from Navy and Coast Guard activities. Such disturbance was reduced in the 1980s and 1990s as the Navy and Coast Guard closed their NWHI stations. New threats, however, are now perpetuating the species' decline. These include starvation due to reductions in prey resulting from changes in the ecosystem brought about by climate variation and disruption and past commercial fishing, entanglement in marine debris, predation by sharks, attacks on pups and females by aggressive adult male seals, and loss of pupping beaches to rising sea levels.

The most encouraging sign for the species' long-term survival has been a recent increase in monk seal numbers in the Main Hawaiian Islands (MHI). Monk seal breeding colonies apparently were eliminated from the MHI soon after the first Polynesians arrived in Hawaii some 1,500 to 2,000 years ago. Over the past few decades monk seal sightings and births have increased steadily in the MHI and scientists estimate that more than 150 seals occupy the MHI at present, with 10 to 15 pups born per year (not including births on Niihau, a private Island and for which complete data are not available). In 2011, 17 pups were born in the MHI, plus 6 to 12 additional pups born on Niihau. If the rates of increase in the MHI and decrease in the NWHI continue at their current rate, the number of seals in the MHI could equal those in NWHI by the year 2023 with about 300 to 350 seals in each area (Baker et al. 2011). The increase in the MHI provides the public an opportunity to see monk seals in the wild, but it also leads to increasing interactions with beach goers and recreational fishermen, as well as exposure of the seals to diseases from domestic and feral animals. Such interactions pose significant new research and management challenges that must be met if the Hawaiian monk seal is to persist.

The National Marine Fisheries Service has lead responsibility for Hawaiian monk seal research and management. It relies heavily on partnerships with other government agencies, especially the Hawaii Department of Land and Natural Resources, the U.S. Fish and Wildlife Service, the U.S. Coast Guard, the

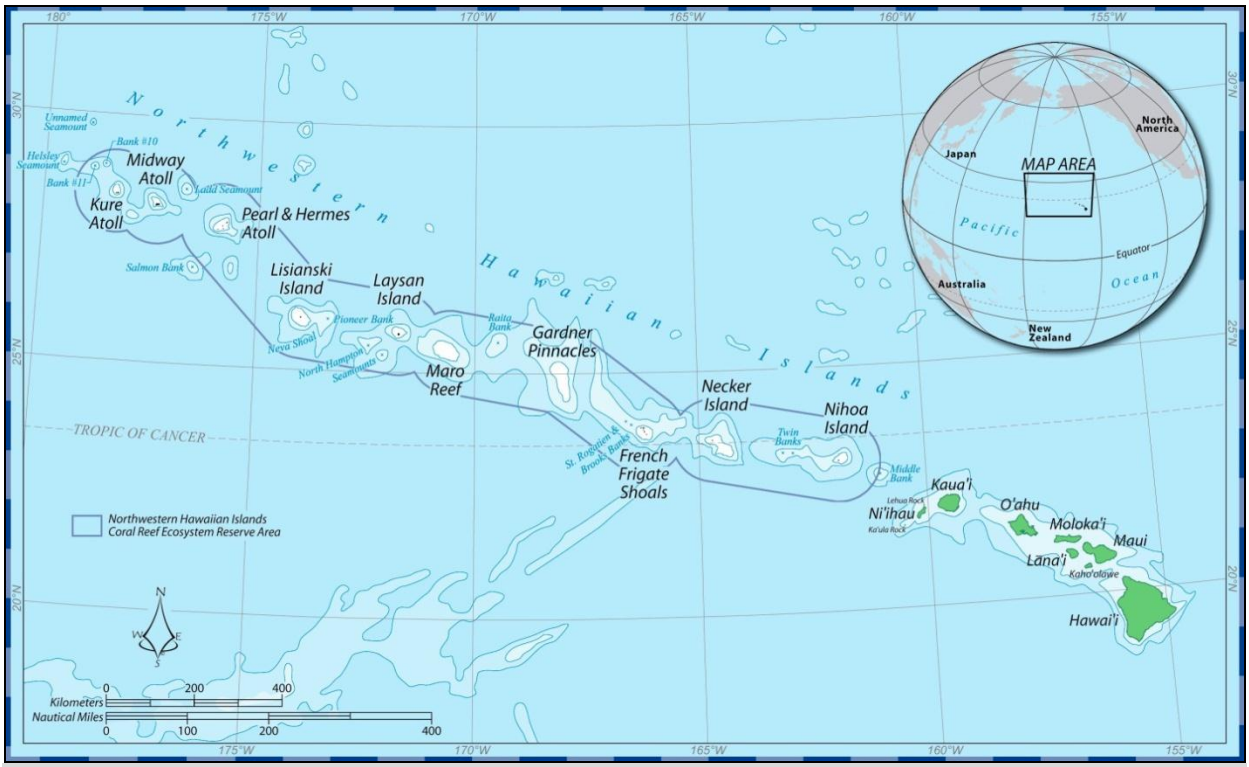

Figure IV-10. Map of the Northwest Hawaiian Islands archipelago (Source: NOAA)

Office of National Marine Sanctuaries in the National Ocean Service, the National Park Service, the U.S. Navy, and the Marine Mammal Commission. Other vital partners include non-governmental groups, such as The Marine Mammal Center, Marine Conservation Institute, Hawaiian Monk Seal Response Team Oahu, Monk Seal Foundation, Waikiki Aquarium, Hawaii Wildlife Fund, and many citizen volunteers in the MHI. To help guide recovery work, the Service has established a Hawaiian Monk Seal Recovery Team composed of recovery program partners and adopted a Hawaiian monk seal recovery plan that was updated in 2007 (National Marine Fisheries Service 2007).

The Marine Mammal Commission has devoted special attention to the Hawaiian monk seal since the mid-1970s when it recommended the species be listed as endangered under the Endangered Species Act. The Commission held its 2009 annual meeting in Hawaii, in large part to review monk seal recovery work by the Service and its key partners. As described below, in 2010 the Commission sent letters to the Service and other involved agencies providing recommendations and comments based on its review.

Funding for Hawaiian monk seal recovery

Inadequate funding has been a longstanding problem for the Hawaiian monk seal recovery program. The logistics and costs of working at the six major breeding sites in the remote NWHI (i.e., French Frigate Shoals, Lisianski Island, Laysan Island, Pearl and Hermes Reef, Midway Atoll, and Kure Atoll – see Figure IV-10) are substantial. Nevertheless, that work has been crucial, as personnel at the field sites collect essential data on the seals such as their abundance, age structure, vital rates; the risk factors impeding their recovery such as entanglement in marine debris, inadequate prey, and predation by sharks; and measures for promoting their recovery. In most years staff are present at major breeding atolls for only about one third of the year, principally during the spring and summer pupping and nursing season. In Fiscal Year (FY) 2008, recovery funding declined to about $2 million, and total field time was about half of the level of previous years.

To address this problem, Congress raised the National Marine Fisheries Service's funding request for the species in FY 2009 to $5.7 million. The increase allowed an expansion of field work in the NWHI and filled many unaddressed research and management needs in the MHI. For FY 2010, the Service was able to maintain funding at nearly the same level—$5.4 million.

On 17 June 2010 the Commission wrote to the Administrator of the National Oceanic and Atmospheric Administration providing a copy of its 10 March 2010 comments and recommendations to the National Marine Fisheries Service. The letter noted that essential recovery actions for the Hawaiian monk seal would require a budget both large enough and consistent enough over time to create a focused, sustained response to current threats. Examples of such actions include a multi-year translocation program to improve juvenile survival rates in the NWHI, seal behavior modification to reduce risks of seal interactions with people in the MHI, reducing risks of infectious disease, and increased field camp efforts in the NWHI. Noting that the Service's recovery plan projected funding needs at nearly $2 million above the levels available in Fiscal Years 2009 and 2010 and that additional funding would be needed before important new recovery projects could be developed, the Commission recommended that the Agency fund the monk seal recovery program at the full $7.2 million level projected in the recovery plan. On 17 August 2010, the Service responded that it would consider requesting additional funding for monk seal conservation in 2011, but that it would need to compete with other high priority needs within NOAA and throughout the federal government.

In FY 2011, funding for the monk seal program declined to $3.3 million (about 40 percent) and the Service's line item request for work on Hawaiian monk seals for FY 2012 was approximately $2.5 million, roughly the same level that had been provided during the decade prior to 2007 when the revised monk seal recovery plan was adopted. In light of this situation, the Marine Mammal Commission again wrote to the Service on 17 November 2011 recommending that the Service restore funding for Hawaiian monk seal recovery efforts for FY 2012 to at least $5.6 million, the average amount allocated in Fiscal Years 2009 and 2010, and include that amount in its annual monk seal line-item requests for the foreseeable future.

At the end of 2011, the Commission understood that the Service was considering increasing the FY 2012 funding level with discretionary funds, but had not made a final decision to do so. The Commission also understood that funding levels for FY 2013 were likely to decrease given anticipated cuts in the federal budget.

Research and management in the NWHI

Population monitoring: Field studies in the NWHI are important not only to monitor population status and carry out research, but also to undertake opportunistic interventions, such as disentangling seals from marine debris, moving pups away from areas subject to shark predation, and administering medical treatment to injured seals. Service records from 1980 through 2011 indicate field teams were involved in interventions that improved the probability of survival for more than 530 seals. Including captive care and other types of activities, around 30 percent of the monk seals alive today are a result of those conservation interventions (NMFS unpublished data). Females benefiting from various interventions have survived to give birth to at least 220 pups, significantly improving pup production in the NWHI and the size of the current population. The benefits of other conservation actions, such as removing entangling debris from beaches, are difficult to describe quantitatively but almost certainly contribute to monk seal conservation.

With the additional funds provided by Congress in 2009 and 2010, the Service was able to (1) lengthen its field camps during the pupping and nursing season at all major pupping sites, (2) establish a year-round field camp at Laysan Island to conduct a deworming trial (Figure IV-11) and assess the effectiveness of year-round management efforts for various conservation threats (e.g., starvation, entanglement, adult male aggression), and (3) increase field research at a smaller breeding site, Nihoa Island. Following its 2009 annual meeting, the Commission recommended to the Service that it maintain field crews at the increased 2009 level in the NWHI, including Nihoa Island, for the foreseeable future. With the increased funding in FY 2010, the Service was able to do so.

Figure IV-11. A scientist with the University of Hawaii Joint Institute for Marine and Atmospheric Research, working with NOAA's Pacific Islands Fisheries Science Center, applies topical deworming medication on a juvenile seal at Laysan Island. (Source: National Marine Fisheries Service)

Population monitoring in 2010 revealed an increase in pup production from 118 to 147 pups born in the NWHI and a slight increase in juvenile survival rates at many of the atolls. In addition, field personnel carried out some two dozen interventions to protect seals in various ways, including moving weaned pups away from areas of high shark predation risks, disentangling seals, and interrupting attacks by sharks and aggressive male seals. In 2011, the Service was able to take advantage of cruise schedules and field camp resources from 2010 to continue field efforts at all six major breeding atolls. It also maintained its winter field camp at Laysan Island although the crew had to be evacuated for a brief time because of the 11 March earthquake off Japan and resulting tsunami. Field results in 2011 indicated a population estimate at the six major breeding colonies of 909 seals with 141 pups, which were comparable to levels found in 2010. Field teams performed more than 50 interventions to protect seals, not including work at Laysan to improve juvenile survival through the administration of a deworming drug.

Improving juvenile survival: Most of the decline of monk seals in the NWHI over the past 30 years has been from poor juvenile survival. Although shark predation and entanglement in marine debris are contributing factors (see below), observations of starving, malnourished, and undersized pups and juveniles indicate that insufficient prey in some areas has been a significant factor. Potential causes include natural ecosystem variability, variability induced by climate disruption, downstream effects of past fishing for lobster, or—perhaps most likely—some combination of those factors. Closure of the lobster fishery and establishment of the Papahānaumokuākea Marine National Monument have eliminated additional impacts from fishing, but nutritional problems persist. Two measures currently under consideration to improve the condition of juveniles include deworming trials and temporary translocation.

Monk seals, like all mammals, carry internal parasites that absorb nutrients from food in stomachs and intestines and cause various ailments (e.g., gastrointestinal ulcers). Administering medications to rid juvenile monk seals of such parasites may improve nutrient uptake and their chances of surviving to breeding age when survival rates improve significantly. In 2009 Service scientists initiated worming trials on a sample of juvenile seals at Laysan Island to determine if such treatments improve their condition. The Commission's May 2010 letter encouraged these trials and the Service's August 2010 response indicated that the trials would continue in 2010. In 2011, the Service completed analyses of its initial trials and concluded that its initial efforts had not been effective in reducing parasite loads (Gobush et al. 2011). It also concluded that it should consider different means of administering such treatment and different dosages. In 2011 the Service tested a new topical drug called Profender, which recently had been used with success on captive California sea lions. Scientists can administer Profender without restraining the animals and often can do so while the animals are asleep on the beach. The new drug was applied to 17 seals in 2011. At the end of 2011, preliminary analyses indicated that the drug caused no adverse effects on the seals and that it had reduced or eliminated parasites in some, but not all seals. The Service was unsure as to whether it would administer the drug in 2012 depending, in part, on the availability of funding.

Scientists and managers also have considered bringing pups and juveniles into captivity to get them into good condition before returning them to the wild. That approach was used in the 1980s and early 1990s, but was expensive and exposed the seals to various additional risks. Ten of a group of 12 seals brought into captivity in the mid 1990s developed an eye ailment that led to blindness, which caused the Service to halt those efforts until it could be assured that such an event would not occur again.

Another measure for improving juvenile survival has been to move weaned pups and juveniles from locations where survival is poor to other atolls or islands in the NWHI where conditions are better. Nihoa is one of the few locations where prey resources in the NWHI appear sufficient to support additional seals. Six seals were moved to Nihoa in both 2008 and 2009 to assess their response and survival. Half were seen in 2010, but funding in 2011 was not sufficient to identify all seals at Nihoa and the survival rate of translocated seals could not be determined reliably.

The survival of juvenile seals appears to be better in the MHI, and another option is to move newly weaned and juvenile seals to waters around the MHI until they reach age three when survival rates in both the NWHI and the MHI approach or exceed 90 percent. At that time, the seals would be returned to the NWHI. Although the Service had begun considering such a two-stage translocation, it noted during the Commission's 2009 annual meeting that it would require considerable advance analyses and preparation. In addition, it noted such a program would be very controversial because some people in the MHI strongly oppose moving seals from the NWHI to the MHI for fear that an increase in seal numbers would result in an increase in interactions with fisheries and a decrease in commercial and recreational fish populations. The Commission recognized the potential for direct fishery interactions but did not believe competition for fish species would be significant because monk seals generally do not forage on the species targeted by commercial and recreational fisheries. Therefore, the Commission recommended that the Service consult with the Hawaiian Monk Seal Recovery Team and key recovery program partners to prepare and analyze a translocation plan.

To assess the potential utility of translocation to and from the MHI, the Commission recommended that the Service move a small group of weaned pups born in the NWHI to the MHI and a comparable

number of seals three years of age or older born in the MHI to the NWHI. This would avoid an increase in the number of seals in the MHI and allow assessment work to begin more quickly. Noting that pup production is declining rapidly in the NWHI, the Commission's 10 March 2010 letter urged the Service to move as quickly as possible with planning, securing necessary permits and funding, and preparing the necessary environmental impact statements. The Service's 5 August 2010 reply noted that it had contracted for the preparation of a programmatic environmental impact statement to evaluate impacts of several enhancement actions, including the two-stage translocation, that it planned to develop a comprehensive public outreach strategy on the issue, and that it would consult with the recovery team, the Commission, and other key partners in developing the translocation plans.

As discussed below, the Service completed a draft programmatic statement in the summer of 2011 and the Commission provided further comments and recommendations in November 2011.

Shark predation: In the mid-1990s shark predation on monk seal pups increased sharply at French Frigate Shoals. Nearly a third of all pups born at the atoll in 1996 were either known or inferred[10] to have been killed by sharks. Such predation removed 207 of the 854 (24 percent) pups born at this atoll between 1997 and 2010. By comparison, pup deaths attributed to sharks at Laysan and Lisianski Islands during that same period amounted to just 2 percent (10 of 540) and 4 percent (13 of 334), respectively, of pups born at those sites. In 2010 nine documented shark attacks resulted in at least six deaths for a loss of 16 percent (6 of the 37 pups born that year). In 2011, 5 of 37 (14 percent) pups born are known or inferred to have been killed by sharks.

Galapagos sharks have been responsible for all observed shark attacks during this period. Recent studies of Galapagos shark movements at French Frigate Shoals indicate that the problem is caused by a small number of individual sharks that have learned to patrol pupping beaches at this atoll in search of pups in the water. To reduce the number of shark-caused deaths, the Service has moved newly weaned pups to other islets at the atoll where shark predation has not been a problem. In 2010, 37 pups were born at the atoll and 17 were moved (after weaning) to areas of lower shark predation risk. In 2011, 15 of the 37 pups born were moved after weaning. Although this approach has been successful in reducing predation on weaned pups, it has not reduced predation on pups before they wean. The Service has considered moving mother and pup pairs prior to weaning but considers that action too great a risk because it may disrupt the mother-pup bond essential for the pup's survival.

Another measure for reducing shark predation involves attempts to identify and kill the Galapagos sharks observed preying on pups. Those efforts have been focused exclusively in areas near pupping sites and have involved gear closely tended or monitored from shore. Such efforts began in 2000, but achieved limited success because the sharks quickly learned to avoid people and boats. Between 2000 and 2007 Service field personnel caught only 12 sharks and shark predation levels have remained higher than those observed at any other atolls. Thus, such predation continues to pose a major obstacle for recovery of the French Frigate Shoals colony.

In 2008 and 2009 the Service halted efforts to catch sharks while it tested various shark deterrents, none of which proved effective. In 2010, the Service tried several new methods, including short drum-lines, five-hook bottomsets, hand lines, and a spring-loaded net set along the beach that could be triggered when sharks came within a few feet of it. The Service proposed catching up to 20 Galapagos sharks in 2010 within 400 meters of the atoll's pupping beaches.

Catching and killing sharks has been controversial. Among other things, Native Hawaiians hold a special reverence for sharks and have opposed killing them unnecessarily. In addition, government agencies have initiated concerted efforts to protect all of the region's marine life through designation of all NWHI waters as part of the Papahānaumokuākea Marine National Monument. However, the Galapagos shark population at the atoll is believed to number several hundred with most individuals staying in deep water around atolls. For that reason the Service considered—and the Commission concurred—that a limited catch of individuals inside the Atoll lagoon near pupping beaches was

[10] Inferred shark-related deaths include sudden disappearances of pre-weaned and newly weaned pups that cannot be explained by other known mortality factors based on observations at the times of the disappearance.

reasonable and not likely to pose a serious risk to either the shark population or the atoll ecosystem. The Service's 5 August 2010 letter to the Commission indicated that a permit application to take 20 sharks from Monument waters had been approved, that the Service had contracted a professional shark fisherman to carry out removals, and a Native Hawaiian cultural practitioner had been involved to ensure that the Native community's spiritual concerns about killing sharks would be consistent with their practices. Unfortunately, only one shark was taken in 2010 and only one more in 2011.

To better assess the hypothesis that predation on pups was caused by a few individual sharks, the Commission encouraged the Office of National Marine Sanctuaries to fund a study of the movements of Galapagos and tiger sharks at French Frigate Shoals using sonic tags implanted in a sample of atoll sharks. The Office did so and in its letter to the National Ocean Service, the Commission commended National Marine Sanctuary Program staff at the Papahānaumokuākea Monument for their support. Final results were not available at the end of 2011, but preliminary findings supported the above hypothesis and revealed that the Galapagos shark population at French Frigate Shoals may number 600 or more.

The Commission recommended that the Sanctuary Office's co-manager for the Monument approve the permit application for removing Galapagos sharks at the atoll. The Commission also sent letters recommending approval of the Service's application to Monument co-managers from the Hawaii Department of Land and Natural Resources and the Fish and Wildlife Service. At the end of 2011 the Service planned to secure the needed permit to continue fishing for sharks in 2012.

Entanglement in marine debris and hookings: Since 1982, Service scientists have documented 311 entangled seals on NWHI and MHI beaches (Figure IV-12). Of those, 209 were disentangled, 86 freed themselves, 8 died, and the fate of 8 others was not determined. The number of seals that have drowned at sea or died of wounds and abrasions or become entangled when biologists were not present to record or disentangle them is unknown. Most entangled seals are juveniles caught in netting and line carried on currents to the NWHI from fishing grounds as far away as southeastern Asia and Alaska. In 2010, a total of 13 seals were found entangled in the NWHI; 9 of those were disentangled and released alive and 4 were able to escape unaided. In 2011 a total of 14 seals were found entangled, 8 in the NWHI and 4 in the MHI. One freed itself and the rest were disentangled and released in good condition.

In addition to disentangling animals, field crews in the NWHI have removed hazardous debris from atoll beaches since the mid 1980s. In the late 1990s work also began to remove net debris from the coral reefs surrounding the atolls. Those efforts have removed several hundred tons of net debris, undoubtedly preventing the death and injury of many monk seals, as well as sea turtles, seabirds, fish, crabs, and corals. The Coast Guard and the National Oceanic and Atmospheric Administration have provided most

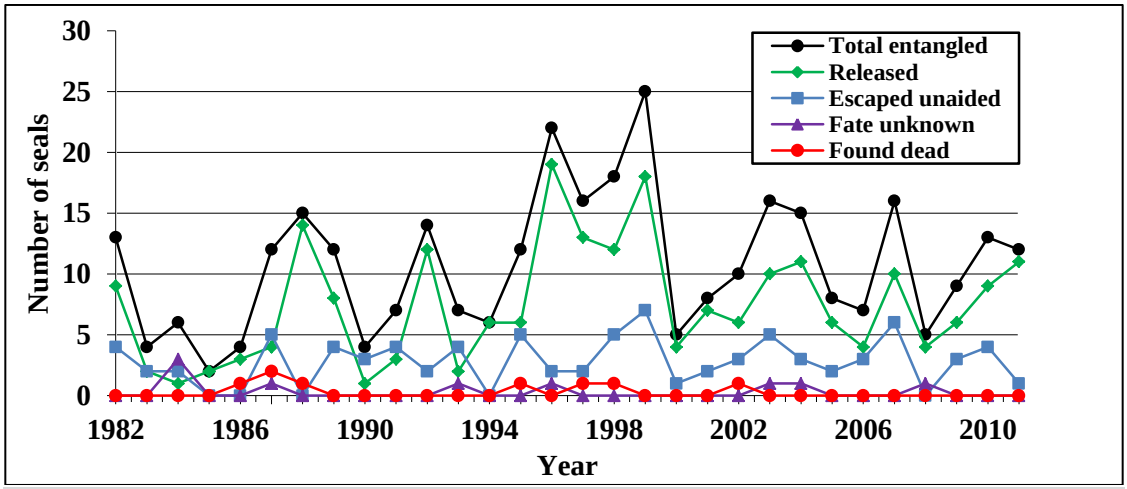

Figure IV-12. Number of entangled Hawaiian monk seals observed from 1992 through 2011. (Data provided by the National Marine Fisheries Service, Pacific Islands Fisheries Science Center)

of the vessel support for these efforts, whereas other agencies, including the Fish and Wildlife Service, the Office of National Marine Sanctuaries, and the state of Hawaii, have provided personnel and/or funding. In 2005 clean-up efforts were reduced to a maintenance level, but accumulation rates since then have proven greater than anticipated. Given the amount of debris in the North Pacific Ocean, the elongated distribution of the NWHI in the southern part of the North Pacific, and the prevailing surface currents, the NWHI effectively act as a sieve or filter, collecting literally tons of debris.

In 2009 NOAA's Coral Reef Ecosystem Division (part of the Service's Pacific Islands Fisheries Science Center) contributed $225,000 and the National Marine Debris Program provided $100,000 to these clean-up efforts. In 2010 the Office of National Marine Sanctuaries, a co-manager for the Papahānaumokuākea Marine National Monument, contributed an additional $225,000. Similar efforts are expected through 2012.

In May 2010 the Commission also wrote to the Assistant Administrator for the National Ocean Service, which includes the Office of National Marine Sanctuaries, and to the Coast Guard commending those agencies for their efforts to remove hazardous debris from atoll reefs. In its letter to the National Ocean Service, the Commission also recommended that the Sanctuary Office work closely with the Service to evaluate debris accumulation rates and give priority to cleaning areas near monk seal pupping beaches. The 25 June 2010 reply from the Ocean Service noted that the Sanctuary Office and its staff at the Papahānaumokuākea Marine National Monument would continue to support monk seal recovery work.

Figure IV-13. Subadult male Hawaiian monk sea found on Oahu with a hook embedded in its mouth from an interaction with recreational fishing gear (Photo courtesy of Tracy Wurth, courtesy of the National Marine Fisheries Service, Pacific Islands Fisheries Science Center).

The Service's Coral Reef Division serves as the lead for coordinating the NWHI debris clean-up efforts and, during 2010, it organized two clean-up trips. One deployment, however, was shortened by a hurricane. Nevertheless, the Division removed a total of 286 derelict nets or net fragments weighing more than 20 metric tons. In 2011 operations were reduced to a single trip because of funding constraints. The trip involved 10 days of clean-up work at Midway and, on its return leg, included stops at Pearl and Hermes Reef, Laysan, Lisianski, and French Frigate Shoals to pick up piles that had been removed from beaches by monk seal field teams during the previous season. In 2011 a total of 15 metric tons were removed, which was substantially less than in previous years when two trips were made per year.

Finally, all known fishery interactions in 2010 and 2011 occurred only in the MHI. In 2010, one seal was found dead after being entangled and drowned in an untended gillnet off Oahu and 11 other seals were seen with hooks thought to be from recreational fishing embedded in their skin (Figure IV-13). Seven of those seals were captured and released after the hooks were removed. The other four were subsequently observed without hooks indicating they were able to shed them. In 2011, no seals are known to have been entangled in gillnets, but nine seals were observed carrying hooks and one seal became entangled in a monofilament line. Of those with hooks, three had the hooks and associated lines removed by responders and the six other seals were resighted without the hooks.

Research and management in the MHI

As noted previously, the MHI population of monk seals now numbers 150 or more and appears to be growing. Their reoccupation of the MHI raises new and difficult research and management challenges.

Assessment and monitoring are difficult because the seals occur throughout the MHI and researchers currently have limited access to Niihau, which appears to have the largest number of seals. Management challenges include interactions between seals and beachgoers, swimmers, divers, recreational fishermen and fishing gear, other wildlife (that may carry diseases), and others who do not wish to have seals in the MHI and are willing to harass or even shoot them.

Prior to 2009 the Service's Pacific Islands Regional Office had no staff designated to work full time on monk seal management issues. In 2009 the Service hired a Hawaiian Monk Seal Recovery Coordinator. The Commission supported this hire but, in its May 2010 letter to the Service, also recommended that the Regional Office hire or contract additional staff to work exclusively on pressing MHI management issues, particularly coordinating volunteers and assisting with public outreach. The Service's 5 August reply advised the Commission that the Regional Office had begun the process of hiring a permanent full-time assistant monk seal coordinator. In addition, it noted three marine mammal response coordinators were being hired on a contract-basis. At of the end of 2010 all those positions had been filled and the Office's budget for monk seal recovery work was $1.7 million.

A second matter of great importance in the MHI is maintaining cooperative involvement of the staff of the Hawaii Department of Land and Natural Resources. To maintain and increase that coordination, the Commission previously urged the Department to seek a grant under Section 6 of the Endangered Species Act to carry out cooperative conservation efforts with the Service on monk seal protection. In 2008 the Department received a one-year grant used in part to fund a monk seal response coordinator on Kauai, as well as various management efforts by other staff. In its May 2010 letters to the Hawaii Department and the Service, the Commission recommended that the two agencies work closely together to complete a multi-year grant for cooperative efforts on endangered species, including the monk seal. The Service's August 2010 response noted that the Department had completed and submitted a three-year grant application and that the proposal had received high marks and was likely to be awarded shortly. Later that year the Service provided the Department with a three-year grant totaling $1.55 million.

Development of a MHI management plan: The 2007 revised Hawaiian Monk Seal Recovery Plan included a provision for developing a MHI monk seal management plan to address critically important issues such as population assessment, interventions with injured or distressed seals, coordination of response efforts, public outreach, disease threats, and other regulatory matters. During its 2009 annual meeting, the Service advised the Commission that the new monk seal coordinator had been assigned the task of completing the plan. In its 10 May letter to the Service, the Commission commended the agency for hiring a new monk seal coordinator and recommended that agency consult with the monk seal recovery team and its partners to complete a comprehensive, long-term MHI management plan as soon as possible.

The Service's 5 August 2010 reply advised that it was preparing a framework to initiate a more formal planning process that would involve substantial coordination with the recovery team, the Commission, and other partner organizations. The Service expected to share an annotated outline of the plan with partner organizations at the end of 2010. However, in 2011 the Service was required to give precedence to the development of a draft programmatic environmental impact statement to analyze options for authorizing several new initiatives to enhance the species recovery (see below). Instead of distributing the outline, the Service held a meeting with staff of the Hawaii Department of Land and Natural Resources to examine threats and the effectiveness of possible management actions. At the end of 2011 the Service hoped to hold additional meetings with its recovery program partners and to complete a draft plan by the end of 2012.

Volunteer monk seal response networks: With technical support from the Service, volunteers on several islands have organized networks to respond to seals on busy beaches, raise money to prepare public outreach materials and public service announcements, provide educational programs for local schools and visitors to the islands, and report sightings of individual seals for population monitoring purposes (Figure IV-14). These networks have grown to include hundreds of committed residents of Hawaii who volunteer thousands of hours to help collect sighting data and carry out routine, but important activities to protect seals that haul out on busy beaches.

Figure IV-14. Three Hawaiian monk seals hauled on Nimitz Beach, Oahu, 9 June 2010 next to recreational fishermen. Note the posted signs cordoning off area of beach. (Photo by Barbara Billand, volunteer monk seal responder, courtesy of the National Marine Fisheries Service, Pacific Islands Fisheries Science Center).

The Commission was impressed by the dedication and efforts of these groups and recommended that the Pacific Islands Regional Office provide an additional staff person to help them develop and organize their conservation activities. The Service's 5 August reply noted that the increased funding available for monk seal work had enabled the Office to fund a contract with a volunteer response coordinator and a contract for additional volunteer coordination on Kauai and Maui. In addition, it noted that it was able to establish a grants program to support a non-profit organization and the University of Hawaii at Hilo to help support volunteer response efforts on Oahu and the Big Island.

In 2010 and 2011, the Service continued to encourage and work closely with various local monk seal volunteer groups offering assistance through various grants and contracts. On Kauai the Service supported a monk seal response coordinator to work with local volunteers. On Oahu it provided a grant to help support activities by a volunteer group called the Hawaiian Monk Seal Response Team Oahu, which also helped coordinate volunteer response efforts on the island of Molokai. On Maui it worked with a local conservation group called Maui Nui, whose response efforts were coordinated by a staff member of the National Ocean Service.

Hawaiian monk seal health care facilities: One of the most urgent needs for monk seal conservation in the MHI is a health care facility to treat injured seals and hold others requiring special attention. Currently no facility is set up specifically to care for injured or distressed animals. SeaLife Park

and the Waikiki Aquarium have generously provided support when they were able, but their abilities to support captive seals are limited. The Kaneohe Marine Corps Air Base has allowed the Service to construct shoreline pens, and its support also has been invaluable. Nonetheless, none of these options can provide all the care needed to respond to the growing number of seals in the MHI.

To meet this need the Pacific Islands Regional Office has been working with The Marine Mammal Center, a non-profit organization that has offered to raise private funds to build a monk seal healthcare facility. The facility is expected to cost about $3 million; however, $1 to $1.5 million would be sufficient to begin construction of a minimally serviceable facility, including holding pools and a small medical building suitable to hold about 12 seals. The facility will be built on lands owned by the National Energy Laboratory Hawaii Authority in Kona on the Island of Hawaii. Construction plans have been prepared and fund raising efforts have begun to cover construction costs. Funds for operating the facility, however, have not been raised. In its May 2010 letter to the Service, the Commission recommended that the Pacific Islands Regional Office continue to work with The Marine Mammal Center to develop the facility and secure the funding needed to cover operating costs. The Service replied that it was doing so and hoped to initiate facility operations by mid 2011. While it had not achieved its goal, at the end of 2011 the Center informed the Commission that it had raised nearly $1 million for the project and now hoped to raise sufficient funds in 2012 to begin construction.

Public outreach: In recent years persons in the MHI have shot several monk seals, presumably because they were opposed to the seals recolonizing those islands. Because seals haul out on public beaches throughout the MHI, extensive efforts are necessary to ensure that visitors and residents are informed regarding conduct necessary to protect both seals and people. Currently, there are many misperceptions regarding these issues. For example, although monk seals remove bait from fishing lines, the available information does not support the idea that monk seals are serious competitors for commercially or recreationally targeted fish species. Instead, the evidence is much stronger that fish stocks in the MHI have been overfished.

Resolving such issues requires dedicated outreach on monk seal biology, ecology, and protection. During the Commission's December 2009 meeting the Service and its partners reviewed many of the actions taken to strengthen public outreach through brochures, web sites, newsletters, public service announcements, presentations to school children and other residents and visitors, and other means. The Service also noted that it planned to use a portion of its increased funding to contract a professional public education firm to survey public perceptions and attitudes towards seals to provide a basis for developing a more effective, targeted public outreach program.

Following its meeting, the Commission recommended that the Service contract a professional firm to (1) develop educational materials and work with agency partners to implement a cooperative, coordinated outreach program focused on segments of the population most likely to interact with seals and (2) ensure delivery of a consistent, well-articulated conservation message. The Service's reply noted that its regional office had started to develop such a contract and that it would ensure outreach work is coordinated among all agencies and organizations involved in promoting monk seal recovery. It also noted that it had hired a contractor to conduct the survey of public attitudes and that the results of that survey would provide a basis for developing the outreach initiative.

In 2011 the public opinion survey was completed (Sustainable Resources Group International, Inc. 2011a) and used as a basis for targeting public education and outreach messages (Sustainable Resources Group International, Inc. 2011b). The survey concluded that, although many people support monk seal conservation, they may engage in activities that could be harmful to the seals because of (1) lack of knowledge that what they are doing is detrimental to seals or (2) concern that the presence of monk seals could interfere with their activities. The results indicated the need for a coordinated, strategic, up-to-date outreach effort to address particular management issues of concern and with messages tailored to residents, fishermen, the military, and tourists. To reach particular audiences, the report recommended the use of signs, guidebooks for visitors, the internet, low cost brochures and fliers, and oral presentations, including formal standardized training for volunteers who regularly interact with the public.

Aversive conditioning for seals in high-risk areas: In recent years several seals have hauled out on popular public beaches and become conditioned to interactions with people. Some seals subsequently adopted behaviors that put them at risk of injury. In a few cases seals also have chased or bitten people in the water and on beaches. To address such problems, the Service has had to capture and move seals, sometimes multiple times and usually with limited success once the seals have adopted such behaviors. At the recommendation of the Hawaiian monk seal recovery team, the Service convened a workshop on aversive conditioning techniques to consider options for discouraging seals from interacting with people.

In its May 2010 letter, the Commission recommended that the Service review the results of its aversive conditioning workshop and then fund studies to develop and test promising techniques to dissuade seals from becoming acclimated to people or frequenting areas that could place them at risk. Such an approach would require clear policies on acceptable hazing methods and circumstances. Once the Service develops those policies, it will need to explain them to the public as part of the outreach program. The Commission also suggested that the Service consider convening a habitat suitability workshop to identify geographic areas in the MHI where seals could be moved with the least risk of interacting with people.

The Service's reply indicated that it was developing a behavioral research program to identify and evaluate techniques to modify the behavior of individual monk seals and reduce the chances of interactions with people in the MHI. It planned to incorporate this program into its MHI research and management plans and ultimately into the Hawaiian monk seal recovery plan. In 2011 Service scientists began to examine historical information in interactions between seals and fisheries, develop forms for recording behavioral responses to human interactions and aversive conditioning experiments, and collect data on various hazing approaches.

Adding monk seals to the Hawaiian Humpback Whale National Marine Sanctuary: The Office of the National Marine Sanctuaries within the National Ocean Service has been an important partner in monk seal recovery efforts. The Office manages two areas that include most of the Hawaiian monk seal's at-sea habitat: the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, which is part of the Papahānaumokuākea Marine National Monument, and the Hawaiian Islands Humpback Whale National Marine Sanctuary. Among other things, managers of the coral reef reserve have provided funds for removing debris from waters off monk seal pupping beaches and for studying shark ecology and movements at French Frigate Shoals. They also have assisted with logistical support for monk seal field teams in the NWHI. Managers of the Hawaiian Humpback Whale Sanctuary have helped with public outreach in the MHI, reported or participated in efforts to respond to seals on MHI beaches, and funded the salary of the state official responsible for overseeing state involvement in monk seal recovery work.

Because the sanctuary's charter and management plan focus almost exclusively on the protection of humpback whales, its support for monk seal recovery work in the MHI has been limited. As noted in past annual reports, the Commission has urged the sanctuary to amend its charter and management plan to add monk seals to its list of protected species. During the Commission's December 2009 review, the manager of the humpback whale sanctuary noted that the sanctuary's management plan would soon be reviewed and that it may be expanded by the addition of conservation measures for monk seals. The manager noted, however, that certain segments of Hawaii's residential population may be strongly opposed to such additions.

Although some might be opposed, the Commission also believes that others would be strongly supportive. In its 10 May 2010 letter to the National Ocean Service, the Commission commended the sanctuary's staff for its help with monk seal recovery work and recommended that Hawaiian monk seals be added to the humpback whale sanctuary designation document and management plan. It also suggested that the sanctuary clarify that the purpose of doing so would be to assist in carrying out non-regulatory tasks, particularly public education and outreach, coordinating volunteer networks, responding to monk seal rescues and emergency situations, and supporting research and monitoring studies.

The National Ocean Service's 25 June 2010 reply noted that it would continue to assess how it could use its resources for the coral reef reserve and humpback whale sanctuary to support future monk seal recovery work. On 14 July 2010 the sanctuary office announced plans to hold a series of public scoping

meetings throughout the MHI in August 2010 (75 Fed. Reg. 40758). During those meetings sanctuary staff noted that the management plan review process was an opportunity to consider adding protection for various additional resources, such as sea turtles, coral reefs, Hawaiian monk seals, and other marine mammals, to the sanctuary's mission. It also noted that it was interested in comments on whether this might be appropriate and, if so, what resources should be included, what actions might the sanctuary take, and how might sanctuary boundaries be modified in light of such actions. A Commission representative participated in several scoping meetings and noted the Commission's support for adding Hawaiian monk seals to the sanctuary's list of protected species.

On 15 October 2010, the Commission also wrote to the staff of the sanctuary to comment on its management plan review. The Commission reiterated the need for the sanctuary to expand its mission from one focused on conservation of a single species (i.e., humpback whales) to one embracing a broad ecosystem perspective and management activities that would complement those of other management agencies responsible for conserving biological resources from the shoreline out to the 100 fathom contour. The Commission suggested adopting a sanctuary vision and mission statement reading something like the following:

> Vision: To protect, conserve, and, where appropriate and possible, restore the marine life, marine habitat, ecological health, and significant historical relics of the ocean ecosystem that endows the main Hawaiian Islands with a bounty of intrinsic, cultural, economic, recreational, educational, and scientific values.
>
> Mission: To manage the sanctuary in a sustainable manner that respects and balances the needs and rights of all who now enjoy, use, and rely on the sanctuary's benefits; that recognizes and promotes the essential role of partnerships and shared responsibilities of Native Hawaiians, the public, private organizations, and governmental entities with vested interests in their perpetuation; and that preserves undiminished rights and opportunities for all future generations to benefit from and enjoy its blessings.

To reflect this broad scope, the Commission recommended that the name of the sanctuary be changed to something such as the Main Hawaiian Islands National Marine Sanctuary. The Commission also recommended that the management plan include provisions for establishing an interagency coordinating committee chaired by the Sanctuary's co-superintendents and composed of representatives from key management agencies to ensure that its research and management activities complement those of other agencies. The Commission also recommended that, with regard to marine mammals, sanctuary staff consult with the National Marine Fisheries Service to identify sanctuary actions to help (1) protect and promote reoccupation of monk seals in the MHI, (2) reduce risks of entanglement and ship collisions with humpback whales, (3) minimize harassment of spinner dolphins by tour boats, private dolphin-watching vessels, swimmers, and divers, (4) monitor and assist with the recovery of the insular stock of false killer whales, and (5) respond to stranded or distressed marine mammals.

At the end of 2011, the sanctuary's staff was considering comments received during the scoping process. The management plan review process was expected to take at least three more years to complete. Future steps require the preparation of proposed and alternative management actions based on scoping comments, draft and final environmental impact statements analyzing those alternatives, an analysis of economic impacts, and adoption of a final plan and any revisions to the sanctuary designation document.

Expansion of Hawaiian monk seal critical habitat

With certain exceptions, section 4(b)(2) of the Endangered Species Act requires the designation of "critical habitat" for species listed as endangered or threatened. Critical habitat areas include physical or biological features essential to the conservation and recovery of the species and which may require special management considerations. In 1988 the Service designated critical habitat for Hawaiian monk

seals that included all beaches and near shore waters out to the 20-fathom isobath around all of the Northwestern Hawaiian Islands except the Midway Islands. Since that designation new information on the species' ecology and movement patterns has indicated that other areas in the NWHI are essential to the species' survival. In addition, since 1988 monk seals have begun to reoccupy MHI habitat that also is essential for their recovery. In light of those developments, several environmental groups petitioned the Service in July 2008 to include additional areas as critical habitat in both the NWHI and the MHI.

On 14 July 2011, in response to a petition by three conservation groups, the Service proposed rules to expand critical habitat boundaries for the endangered Hawaiian monk seal (76 Fed. Reg. 32026). In the NWHI, it proposed including all beaches and waters in the NWHI within the 500 m isobath with the exception of the protected harbor on Sand Island in the Midway Islands. For the MHI, it proposed including most shoreline areas and waters from a point 5 m above the high tide line (generally identified as reflecting the line of vegetation or debris) out to a depth of 500 m around all islands. In the MHI the proposal excluded developed harbors, shorelines of certain military facilities, and existing shorelines that have been armored with bulkheads or rock rip-rap to prevent erosion. Together the designated areas in the NWHI and MHI would cover more than 28,500 km^2 (11,000 mi^2) and most areas where monk seals are likely to occur.

In support of its proposal, the Service noted that the proposed areas included six types of essential physical and biological features necessary for the species' recovery. They are (1) beaches preferred for pupping and nursing, (2) shoreline areas for haul-out, resting, and molting, (3) coastal areas with low levels of human disturbance, (4) shallow sheltered areas adjacent to pupping and nursing areas, (5) marine areas with adequate prey quality and quantity, and (6) foraging areas from 0 to 500 m deep. The Service also noted that activities within the proposed boundaries that might require special management consideration include, but are not necessarily limited to: (1) in-water and coastal construction, (2) dredging and disposal of dredged material, (3) energy development, (4) activities that generate water pollution, (5) aquaculture, (6) fisheries, (7) vessel groundings and projects posing oil spill risks, and (8) military exercises.

On 5 August 2011, the Commission commented to the Service on the proposed revision of critical habitat noting that the action was an appropriate, proactive step that was in keeping with the species critical status and need to ensure its protection. The Commission therefore recommended that the Service adopt the proposed rule as written. On 7 November 2011 the Service extended the public comment period for an additional 60 days through early January 2012 (76 Fed. Reg. 68710). The Service was expected to make its final decision in 2012.

Expansion of recovery efforts for Hawaiian monk seals

In August 2011 the Service announced the availability of a draft programmatic environmental impact statement analyzing several new initiatives to enhance the monk seal's prospects for recovery. Those activities would supplement ongoing research and management work and, specifically, included the proposed two-stage translocation described above to increase survival rates of juvenile seals in the NWHI. The Service also proposed to (1) monitor for infectious diseases and develop vaccines and vaccination protocols for two vectors of particular concern for monk seals (i.e., West Nile virus and morbillivirus); (2) test and, as warranted, expand deworming treatments to reduce parasite loads in juvenile monk seal digestive tracts; (3) test and, as appropriate, use new methods to modify monk seal behavior patterns that place them at risk from interactions with people and fishing gear in the MHI; and (4) test and, as appropriate, use drugs on male seals to reduce aggressive behavior toward pups, juveniles, and adult females.

On 24 October 2011 the Commission wrote to the Service commenting on the draft statement and proposed plans. Based on its review, the Commission commended the Service for preparing a clear and comprehensive evaluation of new or expanded recovery actions and recommended that the Service (1) move forward with the proposed two-stage translocation program as quickly as possible; (2) consult regularly with outside experts on the development of the translocation program and, after a suitable period

of time, review progress on its implementation; (3) consider including in the final programmatic environmental impact statement a discussion of issues surrounding ecosystem-based management measures to enhance juvenile survival in the NWHI; and (4) give high priority to further testing of a morbillivirus vaccine on captive monk seals to identify possible side effects of the vaccine on seals. At the end of 2011 the Service was incorporating comments into a final programmatic environmental impact statement and was expected to make a final decision on what further actions it would take to modify and expand monk seal recovery activities in 2012.

Florida manatee (*Trichechus manatus latirostris*)

The Florida manatee is a subspecies of the West Indian manatee (*T. manatus*). It occurs in the southeastern United States at the northern limit of the species' range. In summer at least a few Florida manatees range west to Louisiana and Texas and north to the Carolinas. In winter almost all manatees are confined to the southern two-thirds of the Florida Peninsula because they are unable to survive long periods in water colder than 18-20ºC (64-68ºF; Bossart et al. 2002).

To survive winter temperatures all Florida manatees—even those in southernmost Florida—retreat to local warm-water refuges on the coldest days. (Laist and Reynolds 2005a). Currently, 50 or more manatees use about 15 such refuges during all or most winters. These refuges are created by natural springs, power plant outfalls (Figure IV-15), and passive thermal basins. The latter consist of small pockets of warm water heated by solar radiation or microbial degradation of benthic organic material trapped beneath a lens of cold, less dense fresh water at the surface. With no direct warm-water input, passive thermal basins may cool to the extent that they do not support manatees during particularly severe or prolonged cold weather. Because of their strong site fidelity to individual refuges or groups of refuges in winter, Florida manatees have established four relatively discrete subpopulations (also called management units), in (1) northwest Florida, (2) southwest Florida, (3) the upper St. Johns River, and (4) coastal waters along the Atlantic seaboard.

Florida manatees are listed as endangered under the federal Endangered Species Act and under Florida state law. Since 1990 the Florida Fish and Wildlife Research Institute has organized annual statewide surveys to count as many manatees as possible during winter cold fronts that cause most manatees to aggregate at warm-water refuges. The survey counts provide a minimum estimate of population abundance. The counts provide only a general indication of population trends because conditions vary from year to year and a variable but undetermined portion of the total population is counted. Nevertheless, the count results indicate that the population has increased since the 1980s.

The 2010 count tallied a record 5,076 manatees, with 2,780 of these on Florida's east coast and 2,296 on its west coast. The count occurred during one of the coldest periods recorded in Florida and far exceeded the previous record of 3,300 manatees in January 2001. The extent to which the difference reflects an actual increase in manatee numbers is unknown. In 2011, the count was 4,834 manatees, including about 2,400 animals on both coasts.

Despite their apparent increase in numbers between 2001 and 2010-2011, the status and future of Florida manatees remain somewhat uncertain because of high numbers of manatee deaths recorded annually (Table IV-2). In most years at least 25 to 30 percent of all deaths have been attributed to human causes, principally collisions with boats. From the 1970s to early 2000s the Fish and Wildlife Service and state of Florida regulated boat speed limits in many of Florida's waterways to protect manatees. The limits undoubtedly have helped, but have not reduced boat-related deaths to small numbers. Since the mid-1990s large numbers of manatees have died from exposure to brevetoxin—a biotoxin produced naturally by a microscopic dinoflagellate that periodically causes red-tide events in southwestern Florida. Although red tides occur naturally, warming water temperatures and pollution from river discharge and land runoff may be contributing to their increased frequency over the past 15 years.

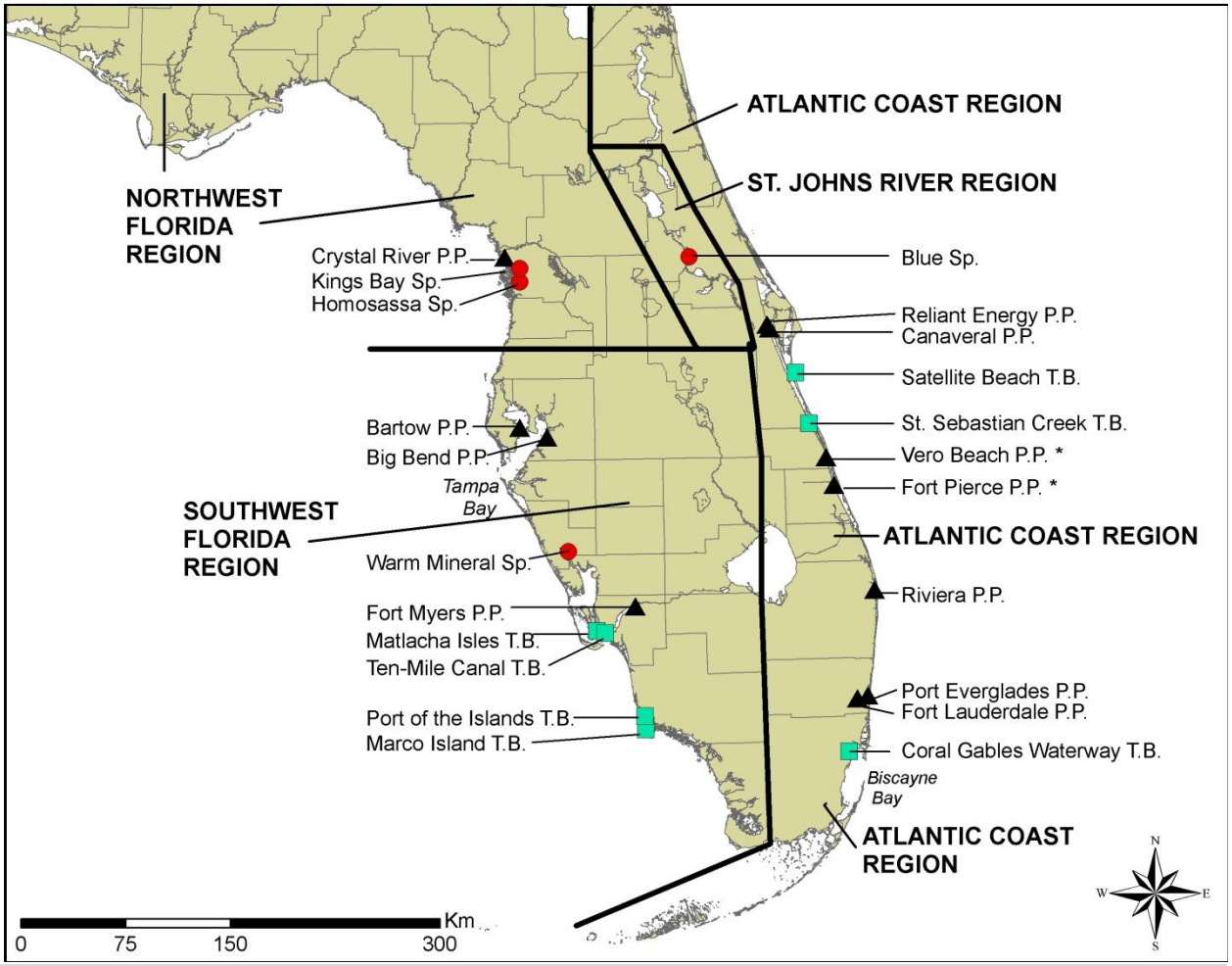

Figure IV-15. Distribution of manatee subpopulations and warm-water refuges. (T.B. = thermal basin, P.P. = power plant). (Source: Fish and Wildlife Service 2001, Laist and Reynolds 2005)

Reported manatee deaths increased from the previous record of 443 in 2009 to 779 in 2010. Many of the 2010 deaths were attributed to a 12-day cold spell, the coldest on record since 1940. In Miami, air temperatures averaged 11.5°C (53°F) for the duration of the cold spell and, at the Tamiami airport in Miami-Dade County, the temperature fell to a low of 3.3ºC (38ºF), the second lowest recorded since 1948 (National Weather Service 2010). At least 288 manatees were thought to have died from cold in 2010 compared to the previous record of 56 in 2009. Many other manatee carcasses were found but either could not be recovered or were too decomposed to determine cause of death. Barlas et al. (2011) estimated that the total number of cold-stress deaths in 2010 may have approached or exceeded 450 manatees. Reported deaths in 2011 also were high (460) due in part to cold stress (112). In total, at least 1,239 Florida manatees are known to have died in this two-year period, about half of which can be attributed to cold temperatures.

The U.S. Fish and Wildlife Service and the Florida Fish and Wildlife Commission lead Florida manatee research and management action, but have been assisted by many other agencies and organizations. Developments to further manatee conservation in 2010 are discussed below.

Table IV-2. Annual number and percentage (in parentheses) of known Florida manatee deaths in the southeastern United States (excluding Puerto Rico): 1978-2011. Data provided by the Florida Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission.

ear	Watercraft	Floodgate and locks	Other Human-Related[1]	Perinatal	Cold Stress	Other[2]	Total
1978	21 (25)	9 (11)	1 (2)	10 (12)	-	43 (51)	84
1979	24 (31)	8 (10)	9 (12)	9 (12)	-	28 (36)	78
1980	16 (24)	8 (12)	2 (3)	13 (19)	-	28 (42)	67
1981	25 (21)	2 (2)	4 (3)	13 (11)	-	75 (63)	119
1982	20 (17)	3 (3)	2 (2)	14 (12)	-	81 (67)[3]	121
1983	15 (19)	7 (9)	5 (6)	18 (22)	-	36 (44)	81
1984	34 (26)	3 (2)	1 (1)	26 (20)	-	67 (51)	131
1985	35 (27)	3 (2)	5 (4)	25 (20)	-	60 (47)	128
1986	33 (26)	3 (2)	1 (1)	27 (22)	12 (10)	49 (39)	125
1987	39 (33)	5 (4)	4 (3)	30 (25)	6 (5)	34 (29)	118
1988	43 (32)	7 (5)	4 (3)	30 (22)	9 (7)	41 (31)	134
1989	51 (29)	3 (2)	5 (3)	39 (22)	15 (8)	63 (36)	176
1990	51 (23)	3 (1)	5 (2)	45 (21)	50 (23)	64 (29)	218
1991	56 (31)	9 (5)	7 (4)	53 (29)	2 (1)	54 (30)	181
1992	38 (23)	5 (3)	7 (4)	48 (29)	1 (1)	69 (41)	168
1993	35 (24)	7 (5)	7 (5)	39 (26)	2 (1)	58 (39)	148
1994	51 (26)	16 (8)	5 (3)	46 (24)	4 (2)	72 (37)	194
1995	43 (21)	8 (4)	5 (2)	56 (28)	0 (0)	91 (45)	203
1996	60 (14)	10 (2)	1 (0)	61 (15)	17 (4)	267 (64)[3]	416
1997	55 (22)	8 (3)	9 (4)	61 (25)	4 (2)	109 (44)	246
1998	67 (27)	9 (4)	6 (2)	53 (22)	12 (5)	97 (40)	244
1999	83 (30)	15 (5)	8 (3)	54 (20)	6 (2)	107 (39)	275
2000	79 (28)	7 (3)	9 (3)	58 (21)	14 (5)	112 (45)	279
2001	82 (24)	1 (0)	7 (2)	63 (19)	32 (10)	151 (45)	336
2002	98 (31)	5 (2)	9 (3)	53 (17)	18 (6)	132 (42)[3]	315
2003	75 (20)	3 (1)	7 (2)	72 (19)	48 (13)	178 (46)[3]	383
2004	69 (24)	3 (1)	4 (1)	72 (26)	52 (18)	82 (29)	282
2005	80 (20)	5 (1)	9 (2)	89 (22)	29 (7)	186 (47)[3]	398
2006	87 (21)	5 (1)	4 (1)	70 (17)	21 (5)	233 (55)[3]	420
2007	75 (23)	2 (1)	5 (2)	59 (18)	19 (18)	162 (50)	322
2008	90 (27)	3 (1)	6 (2)	101 (30)	25 (7)	112 (33)	337
2009	97 (22)	5 (1)	7 (2)	115 (27)	56 (13)	153 (35)	433
2010	83 (11)	1 (0)	6 (1)	98 (13)	288 (37)	303 (39)	779
2011	89 (19)	2 (0)	3 (1)	78 (17)	112 (24)	179 (38)	460

[1] Includes deaths from entrapment in pipes and culverts, complications due to entanglement in ropes, lines, and nets, or ingestion of fishing gear or debris." See FWC http://myfwc.com/research/manatee/rescue-mortality-response/mortality-statistics/categories/

[2] Includes deaths due to other natural and undetermined causes.

[3] Includes a large number of known or suspected red-tide-related deaths in southwestern Florida: 39 in 1982, 151 in 1996, 37 in 2002, 96 in 2003, 92 in 2005, 62 in 2006, and 38 in 2007.

Assuring adequate networks of warm-water refuges

As noted in past annual reports, the Commission believes that the long-term survival of Florida manatees depends on the availability of warm-water refuges to support manatees in each of the four regional management units through cold winter months. Perhaps half of all Florida manatees use power plant outfalls for winter refuges. Power plants and outfalls currently used by manatees have been in existence for at least 35 years (Laist and Reynolds 2005a). Some plants (i.e., Ft. Myers plant, inland Ft. Lauderdale plant, Cape Canaveral plant, Riviera plant, Port Everglades plant, Bartow plant) have been or

are being modernized to burn natural gas instead of oil, thereby extending their operations and the outfalls for another 20 or 30 years. Other plants could soon be decommissioned because of their outdated technology and high operating costs. Decommissioning would significantly reduce the available warm-water refuges now supporting Florida manatees. Limited experience indicates that after plants are closed many manatees accustomed to using their outfalls remain nearby and experience high levels of cold stress unless comparable refuges are close by (Laist and Reynolds 2005b). For that reason, scientists and resource managers have been considering options to minimize risks from plant closures by improving other kinds of warm-water refuges for each manatee subpopulation. Such options include improving manatee access to springs now blocked by dams or other obstructions, creating new passive thermal basins, and tapping warm water aquifers to create small warm-water discharges.

In 1999 the Fish and Wildlife Service convened a Warm-Water Workshop with representatives of electric utilities, government agencies, environmental organizations, and the research community. Following that meeting the Service established a Warm-Water Task Force as a working group of its Florida Manatee Recovery Team. The task force examined opportunities for enhancing manatee access to natural springs, drafted a warm-water refuge plan for enhancing and maintaining networks of warm-water refuges, and developed plans for creating a temporary, artificial refuge should a power company close a power plant. However, progress was limited by insufficient funding.

To address the funding issue, the task force urged the Service and the Florida Commission to add a small surcharge to Florida electric bills. The Marine Mammal Commission also wrote to the Service and the Florida Commission (letter of 8 April 2008) recommending such a surcharge. However, no steps were taken and the Service disbanded its recovery team, including the Warm-Water Task Force.

In 2008 Reliant Energy in Brevard County closed the northernmost plant and outfall on Florida's east coast used by large numbers of manatees. No mitigation measures were taken but, in this case, manatees were able to use the outfall from another plant less than five miles away. Also in 2008, Florida Power & Light Company announced plans to modernize the Riviera Plant in Palm Beach County and the Cape Canaveral Plant in Brevard County (which was the alternative site for manatees previously using the Reliant Energy plant). The Company planned to replace oil-fired generating units with natural gas fired units but in both cases it also planned to continue operating the plants' cooling systems. The refitting should extend the operating life of both plants (and outfalls) for 25 years or more. Had Florida Power & Light Company chosen a course of action similar to Reliant Energy and closed the two plants, perhaps half of the manatees in the Atlantic Coast subpopulation—nearly a quarter of all Florida manatees—would have had no access to warm-water refuges and a winter cold spell could have caused extensive mortality.

On 26 April 2010 the Marine Mammal Commission wrote to the Fish and Wildlife Service noting the need for the agencies and organizations involved in manatee conservation to work together and reinvigorate their efforts to ensure adequate warm-water refuges. The Commission recommended that the Service reconstitute the Warm-Water Task Force to (1) review information on recent cold stress-related deaths, (2) reexamine short- and long-term strategies to ensure that warm-water refuges are adequate to support an optimum sustainable population of Florida manatees, and (3) identify steps to implement those strategies immediately. The Commission also recommended that the Service re-establish a Florida Manatee Recovery Team as soon as possible to strengthen cooperative efforts among key partners. Finally, it emphasized the need to develop and implement solutions, rather than simply monitor threats and trends.

On 20 May 2010 the Service replied that it remained committed to re-establishing a recovery team and associated groups, but it had no immediate plans to reconvene the recovery team because of limited funding and ongoing efforts to respond to a critical habitat petition, conduct a programmatic section 7 consultation on manatee regulatory issues, and publish a rule to protect manatees in Kings Bay. The Service also noted that, if and when it was able to re-establish a team, it would ask it to describe the distribution of a recovered manatee population. The Service also noted that cold related die-offs should be expected from time to time given Florida manatees' occurrence at the northern edge of the species' range and that the Florida Fish and Wildlife Conservation Commission had lead responsibility for responding to

cold stress events. The Service recognized the need to account for such die-offs in recovery planning and to minimize such effects in their overall recovery scheme. With regard to conserving warm-water habitat, the Service aimed to address manatee access to springs and secondary warm-water sites and it welcomed Commission support for those efforts.

The Commission discussed the issue with representatives of the Department of the Interior, which indicated that it would reconsider a fund for improving the availability of warm-water refuges. In September 2010, the Service initiated a structured decision-making process to identify priority actions for developing optimal long-term networks of warm-water refuges for manatees. At the Commission's annual meeting on 10-12 May 2011, the Service indicated that it would focus its efforts on this process rather than reconvening a recovery team.

Structured decision-making process: The purpose of this process is to make management decisions more transparent by clarifying problem statements, the rationale for objectives, alternative actions, consequences of those actions, and trade-offs in selecting a desired set of actions (Gregory and Long 2009). On 12-17 September 2010 the Fish and Wildlife Service and the U.S. Geological Survey jointly convened a first meeting at the Service's National Conservation Training Center in Shepherdstown, West Virginia. The meeting involved convening a panel with representatives of state and federal agencies, including the Marine Mammal Commission, the Florida electric utility industry, and the manatee research community.

This first meeting focused on testing the process to see what kind of results it might produce. Participants found the process constructive and useful for developing strategies to establish long-term networks of warm-water refuges in the absence of power plants. They noted that the fundamental issues were the large proportion of the manatee population now dependent on unreliable sources of warm water (i.e., power plants) and the need to identify and protect reliable warm-water sites not dependent on power plants or technological heat sources to ensure the long-term persistence of manatees both statewide and regionally.

To increase the proportion of manatees using warm-water springs and passive thermal refuges, the group identified alternative actions including: restricting manatee access to power plant outfalls or reducing outfall discharges to encourage manatees to move to other sites; altering freshwater runoff patterns or deepening small areas to create new passive thermal basins; removing barriers blocking manatee access to warm-water springs; maintaining minimum flow rates at natural springs; releasing rehabilitated manatees at natural springs; moving manatees from power plants to natural springs; improving manatee protection at warm-water refuges to encourage greater use; tapping warm water aquifers to create new warm-water refuges; and somehow leading manatees from power plant outfalls to natural springs they would not likely find by themselves.

In February 2011 the Fish and Wildlife Service convened a second meeting of key recovery program partners to discuss results of the September workshop and to determine interest and ways of using the structured decision-making process to identify short- and long-term actions to improve warm-water refuge networks. The participants agreed that the process would be useful and recommended that the Service hold a series of structured decision-making workshops focusing on each of the four regional manatee subpopulations.

At the Marine Mammal Commission's 10-12 May 2011 annual meeting in New Orleans, Louisiana, a Service representative indicated that the Service was planning to contract a facilitator familiar with the structured decision-making process and also was planning a contract for the development of an interactive model to project the likely effects of proposed actions on regional manatee subpopulations. The Commission wrote to the Service on 21 September 2011 expressing support for the Service's plans and recommended that the Service plan its future workshops to ensure ample meeting time for participants to identify, discuss, and agree on specific regional research and management actions. The Commission also recommended that, before holding the planned workshops, the Service assess each of the four subpopulations with regard to (1) the current number of manatees, (2) the current number that rely on power plant outfalls versus other types of warm water refuges, and (3) the additional warm-water refuge capacity needed to meet long-term conservation objectives.

At the end of 2011 the Service had contracted for the development of an interactive model to assess the effects of alternative management actions on regional manatee subpopulations.

Plans to modernize power plants: Florida Power & Light Company has been an outstanding industry partner in manatee conservation efforts. As noted above, the company announced plans to modernize the Cape Canaveral and Riviera power plants, both used extensively by manatees along the Atlantic coast. With closure of the Reliant Energy power plant in Brevard County, the two plants are now the northernmost warm-water refuges used by large numbers of manatees on the east coast and thus are located where manatees would be most exposed to cold stress if the plant outfalls were eliminated. Provisions under the 1972 Clean Water Act prevent the creation of new outfalls that discharge water at temperatures substantially higher than ambient levels. However, plants with outfalls in place at the time the Act was passed may continue operating as long as the outfalls are not substantially modified.

To maintain the outfalls at the two plants being modernized, Florida Power & Light Company is retaining the existing cooling system even though it is replacing all other power plant components. Replacing the two plants is expected to cost roughly $1 billion each and involves tearing down both plants to construct new ones. The Canaveral and Riviera plants are expected to be closed until 2013 and 2014, respectively. To ensure that manatees are not affected while the plants are closed, Florida Power & Light also installed large electric water heaters to discharge warm water during the winter at both plants solely for the purpose of maintaining habitat for manatees. It evaluated the temperature and volume of water needed to heat an area adequate to support manatees in outfalls at both the plants and consulted with the Florida Fish and Wildlife Commission to identify specific requirements for operating the replacement water heaters pending the completion of the new plants. The heating units cost about $5 million per plant; one was installed at the Riviera Plant in 2009 and the other at the Cape Canaveral plant in 2010 (Figure IV-16). They operate whenever ambient water temperatures fall below 65ºF (18ºC) and maintain the refuges at or above 68ºF (20ºC) until such time as ambient water temperatures outside the outfall again rise above 65ºF. The company also monitored manatee use of the refuge, made preparations to rescue cold-stressed manatees in the event of equipment failure, and planned to develop a long-term

Figure IV-16. Manatees at a warm-water refuge created by temporary electric water heaters installed by the Florida Power & Light Company during reconstruction of its Cape Canaveral power plant in Brevard County, Florida. (Photo courtesy of Florida Power & Light Company)

strategy to reduce adverse effects from eventual plant closures. The heating units operated effectively during the cold winters of 2009-2010 and 2010-2011. The state's 2010 count revealed 368 and nearly 1,000 manatees at the Riviera and Canaveral plants, respectively.

Enhancing manatee protection and access at natural springs: During 2010 and 2011 several actions were taken or scheduled to improve manatee protection and access at natural warm-water springs. In late July 2010, a group of agencies and organizations purchased 57.1 acres of undeveloped land, including the spring bottoms, surrounding Three Sisters Spring. Manatees use the spring, which empties into a canal adjoining Kings Bay at the head of the Crystal River. The purchase had been negotiated for more than 20 years and cost $10.5 million. The funds came from the Federal Land and Water Conservation Fund, state of Florida, the Felbum Foundation, The Nature Conservancy, Save the Manatee Club, Friends of Chassahowitzka National Wildlife Refuge Complex, several other non-governmental fund-raising groups, and several local government entities, including the City of Crystal River. Title to the land, which includes a conservation easement, was transferred to City of Crystal River and the state's Southwest Florida Water Management District. The Fish and Wildlife Service will have responsibility for managing the property as part of the Crystal River National Wildlife Refuge.

The Commission had long supported the purchase because as many as 300 manatees use the spring on cold winter days. Surrounded by residential housing, its purchase and protection from development is a major step towards securing long-term protection of the region's network of warm-water refuges. The property also will be used to educate visitors about manatees and the local ecosystem. One of the first management actions taken after its purchase was to remove several large boulders that have impeded manatee access to the main spring. The Water Management District also plans to capture and treat urban runoff now entering directly into the adjoining canal system.

Also during 2010, the Florida Fish and Wildlife Commission announced plans to deepen the spring run at Fanning Springs State Park. This spring is about 40 miles north of Crystal River on the Suwannee River. Like the springs in Kings Bay, it discharges water at 22-23ºC (72-73ºF) temperature. However, years of erosion and siltation from surrounding land use have blocked access to the spring during low water conditions in winter months. By having the spring run restored to its natural depth, the Commission hoped to give manatees and other species, including endangered sturgeons, greater access to the main spring. The project began in the fall of 2011 with funding ($130,000) from the Florida Fish and Wildlife Commission and The Nature Conservancy. It opened new winter habitat for manatees along the Suwannee River, which also includes several other warm springs. Increased manatee use of natural warm-water refuges that are now little used will be essential for maintaining manatee abundance as power plants are retired.

Funding for the enhancement of warm water refuges: At its 10-12 May 2011 annual meeting the Marine Mammal Commission reviewed efforts to ensure the availability of long-term warm-water habitat. Inadequate funding has been and likely will continue to be a problem given declining agency budgets. In its 21 September 2011 letter to the Service, the Commission expressed its view that Florida power companies bear considerable responsibility for supporting the research and management efforts needed to ameliorate the effects of power plant closures on manatees. To date, manatees, utility companies, and electricity consumers have all benefitted from the availability and use of the plant outfalls. The manatees have benefited from the warm-water habitat. Electric utilities have saved tens of millions of dollars by avoiding requirements to install new cooling systems that otherwise would have been required by the National Pollution Discharge Elimination System. Floridians have benefited by not having to pay the increased costs (that would likely be passed on to the consumer through increased utilities rates) that would have been required to install those new cooling systems.

To date some companies, most notably the Florida Power & Light, have been outstanding partners in manatee conservation, but they have contributed relatively little financially to efforts to address the long-term risks associated with plant closures. The Commission's 21 September letter recommended that the Fish and Wildlife Service consult with the state of Florida and the Environmental Protection Agency to consider remedies to this situation. It further recommended that, as a condition for maintaining exemptions from thermal discharge requirements, Florida power companies contribute annually to a

revolving fund to support the research and management activities needed to improve and maintain long-term regional networks of warm-water refuges capable of supporting optimum sustainable subpopulations of Florida manatees as power plants are closed. Such activities might include, but not be limited to, dredging streams or "runs" emerging from springs so that manatees have access to them, testing the feasibility of opening wells to create or enhance warm-water refuges, assessing the key features of passive thermal basins for supporting manatees through the winter, purchasing land around key warm-water refuges to assure long-term protection, testing the feasibility of translocating animals to warm-water springs now not used or little used by manatees, and assessing and monitoring manatee use of key warm-water refuges.

At the end of 2011, the Service had not yet replied to the Commission's letter.

Designation of the Kings Bay Manatee Refuge

Kings Bay is a roughly circular water body a mile wide at the head of Crystal River. It is formed by a complex of natural springs that discharge water at 22ºC (72ºF) and is used by more manatees than any other natural spring in Florida. The number of manatees using the Bay in winter has increased steadily and in January 2010 a record 565 manatees were counted in its waters and adjoining canals. Because of its clear warm water and the presence of manatees, Kings Bay has become a major attraction drawing tens of thousands of snorkelers and divers annually to swim with wild manatees. However, some divers chase the manatees in hopes of touching them, and on occasion stand on, kick, or otherwise harass them. Despite enforcement efforts such incidents have increased in frequency as the numbers of divers and manatees have increased.

The Fish and Wildlife Service purchased most of the islands in Kings Bay and some adjoining submerged lands to protect manatees and their habitat. In 1982 those areas were designated as the Crystal River National Wildlife Refuge. Refuge staff members provide advice on proper conduct when diving with manatees and enforce rules prohibiting manatee harassment. The Service also designated 7 small areas of the Bay covering a total of about 45 acres as "manatee sanctuaries" and prohibited all human access (e.g., boats, swimmers, and divers) within them. In addition, the state of Florida established regulations covering most of the bay and requiring that boats use slow or idle speeds between 15 November and 15 March.

The Commission believes that the problem of continuing harassment stems from the Fish and Wildlife Service policy of allowing divers to touch wild manatees. In the Commission's view, this practice and the promotional videos showing divers coming in contact with animals foster an expectation of some divers that they will be able to touch wild manatees. As a result, some divers chase animals, many of which shy away from divers. As noted in past annual reports, the Commission therefore recommended that the Service adopt rules that prohibit touching manatees or approaching them closer than 10 feet. The Service has declined to actively oppose touching manatees in a way that does not cause harassment believing it is harmless to allow divers to touch manatees that approach them, which some animals do. Nonetheless, the Fish and Wildlife Service and Florida Fish and Wildlife Conservation Commission are working to increase enforcement in an effort to decrease harassment incidents.

On 9 November 2010 the Service announced an emergency rule designating Kings Bay as a manatee refuge (75 Fed. Reg. 68719) to reduce manatee deaths caused by boat collisions and harassment. The Service noted that it would propose a corresponding permanent rule in 2011. The emergency rule remained in place from 15 November 2010 to 15 March 2011 (winter manatee season) in all waters in the Bay and adjacent canals. It imposed a slow speed limit for boats throughout the refuge and provided refuge staff authority to alter boundaries of the seven manatee sanctuaries or establish new sanctuaries on an *ad hoc* basis as needed to protect concentrations of manatees in the Bay. It also identified and prohibited those activities causing harassment of manatees in the refuge, including (1) chasing or pursuing manatees, (2) diving on, disturbing, or touching them when they are resting or feeding, (3) cornering or surrounding them, (4) riding, holding, grabbing, or pinching them, (5) standing on or attempting to stand on them, (6) poking, prodding, or stabbing them with anything, including hands and

feet, and (7) separating mothers and calves or groups. It also prohibited scuba diving and casting nets or fishing lines within an area called Three Sisters Springs.

On 22 June 2011 the Service proposed a permanent rule that closely followed the emergency rule (76 Fed. Reg. 36493). However, the proposed permanent rule also added an additional restriction to reduce boat speeds. An increasing number of manatees have been using the Bay year-round and several manatees have been killed by boats during the summer when a high-speed water sports area has been allowed in central portions of the bay. The proposed rule called for all boats to travel at slow speed throughout the refuge year-round (except in areas where idle speed already is required). In effect, the proposed permanent rule would eliminate the summer high-speed water sports area in the Bay.

The Marine Mammal Commission commented on the Service's proposed rule on 22 August 2011. The Commission supported the designation of the bay as a permanent manatee refuge and the establishment of year-round slow speed requirements throughout the bay. It also commended the Service for clarifying most activities constituting manatee harassment. It noted, however, that the rules would still allow divers to touch manatees that were not feeding or resting and to approach all animals within inches, including those that were feeding or resting. Believing this would continue to encourage divers to chase animals, the Commission again recommended that the Service promulgate a rule to prohibit divers from petting, rubbing, or touching any manatees or approaching them closer than 10 feet. The Commission also pointed out that allowing such activity was inconsistent with marine mammal viewing guidelines adopted by Watchable Wildlife, Inc., which the Fish and Wildlife Service and other wildlife management agencies had endorsed formally. Those guidelines strongly advise marine mammal watchers to follow "hands off" and "keep your distance" standards. Finally, the Commission noted that allowing people to "pet" manatees effectively conditions them and encourages them to approach people. Each year many manatees, including some in Kings Bay, are deliberately harmed by people who consider manatees pests or feel animosity towards them because of boat speed regulations. Accordingly, the Commission emphasized the importance of discouraging manatee behaviors that involve approaching people.

Although the Service was to adopt the final rule in time for the winter manatee season beginning in mid-November 2011, it had not done so by the end of 2011.

State endangered and threatened species rules

In 2003, the Florida Fish and Wildlife Commission received a petition asking it to reconsider the endangered status of Florida manatees under state law. The petition generated considerable controversy and in 2005 the Florida Commission adopted new criteria for classifying imperiled species. The new criteria were based on those used by the International Union for Conservation of Nature (IUCN). However, the state of Florida equated its endangered and threatened categories with the IUCN's highly endangered and endangered categories, respectively. That is, a species that would be considered endangered by the IUCN would be considered threatened by the state of Florida. The state's approach led to concern that many species facing significant conservation threats—including Florida manatees—would be deprived of adequate protection because they would not meet the strict criteria required for IUCN "highly endangered" status.

In late 2007, the Florida Commission was completing its review of manatees under the new criteria and was about to reclassify them. However, the Florida governor wrote to the chairman of the Florida Commission expressing concern about the need for a better method of estimating manatee abundance, the high number of manatee deaths during the previous year, and the need for more time to evaluate the situation. Shortly thereafter, the governor also asked the Florida Commission to reassess the criteria and procedures for listing and managing species under the state's endangered species law. In response, the Florida Commission established a working group of interested parties to develop new state rules for conserving species in need of added protection in Florida.

The Marine Mammal Commission participated as a member of the working group and in early January 2010 received a copy of proposed changes with a request for comments. The new rule stated that any species native to Florida may be designated as threatened or endangered if it is already designated as

endangered or threatened under the federal Endangered Species Act. The rule also stated that a species could be designated as threatened if it met state listing criteria, which would be based on those used by the IUCN to classify species as vulnerable. Vulnerable is the category immediately below endangered on the Red List and is roughly equivalent to the threatened listing category under the Endangered Species Act. Under this rule, the state would have only one listing category (i.e., threatened) for species not already listed under the federal Endangered Species Act.

On 14 January 2010, the Commission sent comments on the new rule noting that it represented a significant improvement over the previous rule and that the Commission supported its adoption subject to certain modifications. The proposed rule defined taking as killing, hunting, harming and harassing listed species. However, it defined the term "harass" more narrowly than the federal laws. It included intentional or negligent acts likely to cause injury to wildlife, but did not include activities that could significantly disrupt reproduction and recovery without causing injury to animals (e.g., installing lights on sea turtle nesting beaches thereby prevent nesting but causing no injury). Therefore, the Commission recommended that the term be defined more broadly to include disruptions of normal behaviors that could have population-level effects.

The Commission also noted some confusion regarding state actions to be taken when species were to be delisted under federal law. The Commission recommended that the language be revised to clarify the steps that would trigger removal of a species from the state list when it was being removed from the federal list and whether those actions would include conducting biological reviews described in the section. To ensure that listing and delisting decisions are not an open-ended process, the Commission recommended that the proposed rule specify the amount of time to be allowed for making determinations as to whether a listing or delisting was warranted and for completing related biological reviews.

In late 2010 the Florida Fish and Wildlife Commission adopted "Rules Relating to Endangered and Threatened Species" (Chapter 68A-27 of the Florida Code). The final rule deleted reference to species scheduled for removal from the federal list. It did not address other Commission recommendations but, nevertheless, the Commission considers it a significant improvement in the state's approach to listing and conserving native Florida wildlife at risk of extinction.

Gray Whale (*Eschrichtius robustus*)

From the mid 1800s to the early 1900s commercial whaling severely depleted the eastern and western North Pacific populations of gray whale. The gray whale was listed as endangered under the Endangered Species Conservation Act of 1969 and that listing was retained under the Endangered Species Act of 1973. The eastern and western populations were listed separately under the Act as distinct population units. The eastern North Pacific population of gray whales was considered recovered and removed from the Endangered Species list in 1994, as described below.

Recovery of the eastern gray whale population

The eastern gray whale population increased to more than 20,000 individuals by the 1990s under protections conferred by the Endangered Species Act and the International Whaling Commission's 1986 moratorium on commercial whaling. At that point many considered it to be near its environmental carrying capacity (i.e., the maximum number of individuals supportable by the environment over a long period of time)—although that position has been challenged by Alter et al. (2007). In 1994 the National Marine Fisheries Service removed the population from the U.S. list of endangered and threatened species, making it the first marine mammal population to be delisted.

The Endangered Species Act requires a five-year status review of delisted species and the Service conducted such a review in 1999. The review again concluded that the eastern population of gray whales was near its carrying capacity and was neither endangered nor threatened as defined by the Endangered

Species Act (Rugh et al. 1999). The review noted, however, that continued population monitoring could provide important insights into a number of biological and management issues related to marine mammal populations thought to be near carrying capacity. For example, it might provide scientists with information about how a whale population adapts as it approaches the limits of its environment, and what factors are important in regulating the population. Many of these kinds of questions pertain to a population's growth patterns and trends, and the factors that cause a population to stabilize after a period of growth.

Population estimates and trends

The Service's determination to delist the eastern population of North Pacific gray whales was based largely on abundance estimates and the resulting trend, as derived from winter counts of gray whales migrating south along the coast of California to their calving grounds. National Marine Fisheries Service scientists have made 23 such counts since 1967. A recent reanalysis of all the estimates (Laake et al. 2009) resulted in an abundance estimate of 19,126 gray whales in the winter of 2006–2007.

This estimate is below the estimated abundance in the late 1990s because the population declined sharply due to an unusual mortality event in 1999 and 2000 (Figure IV-17). During that event, large numbers of emaciated adult gray whales stranded along the entire migratory path from Mexico to Alaska (Figure IV-18). Punt and Wade (2010) estimated that about 15 percent of the non-calf population died in each of 1999 and 2000, compared to about 2 percent mortality in a normal year.

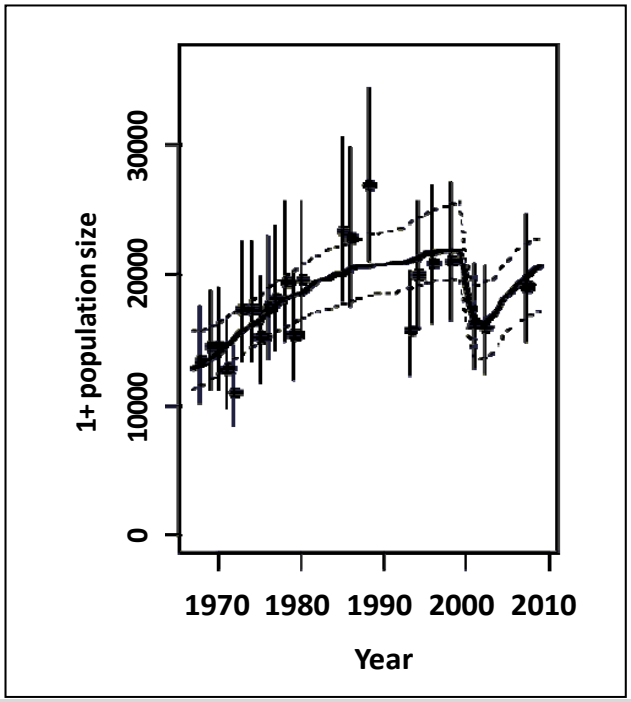

Figure IV-17. Estimated abundance of Eastern North Pacific gray whales from National Marine Fisheries Service counts of migrating whales past Granite Canyon, California. Error bars indicate 90% probability intervals. The solid line represents the estimated trend of the population with 90% intervals as dashed lines. (Punt and Wade 2010)

The poor condition of many of the stranded whales in 1999 and 2000 supports the idea that starvation was a contributing factor to the mortality event. In fact, the availability of food likely is one of the key factors that determine a population's carrying capacity. In support of this idea, Perryman et al. (2002) found a significant positive correlation between the area of feeding habitat available in the Bering Sea (i.e., shallow areas free of ice) and estimates of calf production the following spring. They suggest that longer periods of open water provide greater feeding opportunities, resulting in whales that are in better condition and better able to sustain pregnancy and nurse a calf. Whether the correlation holds in future years remains to be seen, but if it does hold, then gray whales may benefit from a reduction in sea ice caused by climate disruption (Moore 2008). Preliminary results from surveys in some of the breeding lagoons of Baja California indicate that calf production may have been particularly high in 2011 (International Whaling Commission 2011).

A petition to designate the eastern population as depleted: The number of gray whales stranded in 1999 and 2000 provided evidence that the population had been subjected to a strong limiting factor of some kind, leading to a substantial decrease in abundance. On 21 October 2010 the National Marine

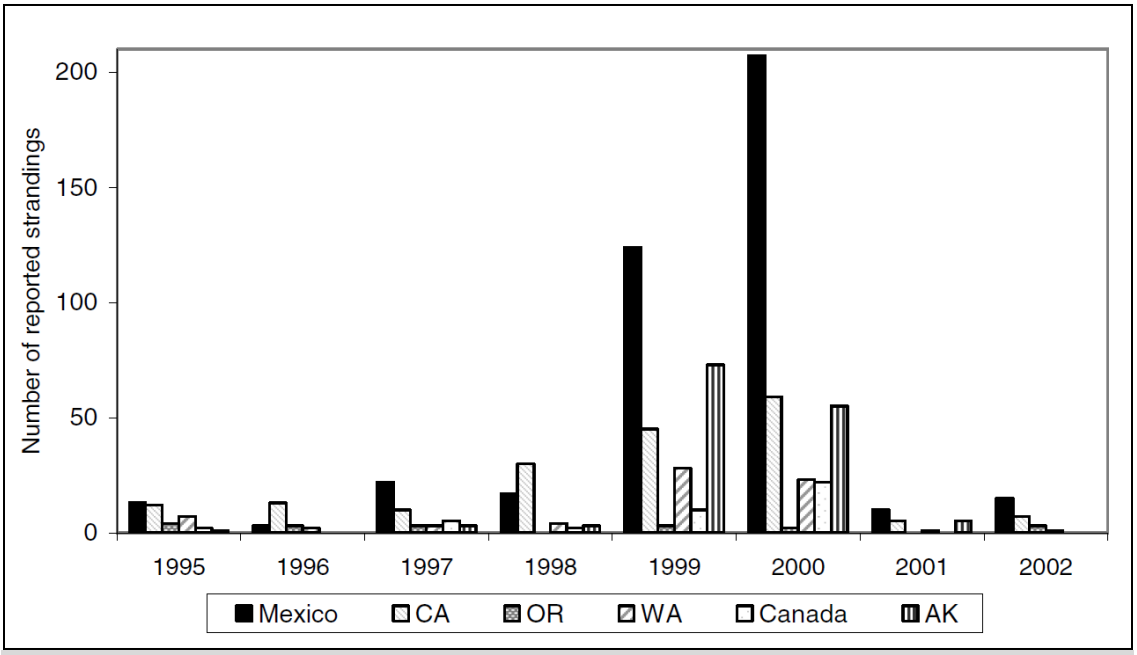

Figure IV-18. Annual trends in reports of gray whale strandings by region, 1995-2002. (Gulland et al. 2005)

Fisheries Service received a petition to designate the eastern North Pacific gray whale population as a depleted stock under the Marine Mammal Protection Act (75 Fed. Reg. 68756). The petitioners requested a status review of this population of gray whales and asserted that it was "…in decline sufficient to classify the stock as depleted, as defined in the Marine Mammal Protection Act, thereby requiring the preparation of a conservation plan to restore the stock to its optimum [sustainable] population."

The Marine Mammal Protection Act and implementing regulations specify that a population stock is to be designated as depleted when its abundance is less than its optimum sustainable population. The optimum sustainable population is defined as a range, the lower limit of which is the population's maximum net productivity level. Thus, the question to be addressed was whether the petition presented sufficient information to conclude that the eastern North Pacific gray whale population had declined to the extent that it might be below its maximum net productivity level and, therefore, warrants a status review. In support of their assertion, the petitioners relied primarily on the Alter et al. (2007) estimates of historical abundance, which are significantly higher than current population estimates. In the petitioners' view, the higher estimates cast considerable doubt on the Service's position that the abundance of the eastern North Pacific gray whale population was above the maximum net productivity level. The petitioners also suggested several factors that may be impeding recovery of the population.

After considerable review of the petition, the Marine Mammal Commission wrote to the Service on 8 December 2010[11] indicating that it did not believe a status review was warranted or would be a good use of limited resources. The Commission stated that resources available to the Service for gray whale studies would be better directed toward careful monitoring and investigation of the factors that may affect their conservation. Continued monitoring of this population during its feeding and reproductive seasons, and during its migration, should yield better insights into population status and the manner in which climate-related changes in the marine environment are or may be affecting the environmental carrying capacity and maximum net productivity level. With those information needs in mind, the Marine Mammal Commission recommended that the National Marine Fisheries Service—

[11] Available at http://www.mmc.gov/letters/letters_10.shtml

- defer any status review until the scientific evidence provides a stronger basis for concluding that the population may be below its maximum net productivity level;
- focus its research and management efforts related to the eastern North Pacific gray whale population on continued monitoring and expanded study of the whales' natural history and factors that may affect conservation of the population, including the whales' responses to changes in their environment;
- establish and fund a program to continue monitoring gray whale abundance and reproduction, and initiate efforts to understand how climate disruption in the Arctic affects gray whale feeding, nutritional status, and carrying capacity; and
- take advantage of opportunities (e.g., at meetings of the Alaska Scientific Review Group, Marine Mammal Society biennial meetings) to convene groups of gray whale researchers from Mexico, Canada, the Service, state research and management agencies, non-governmental organizations, academic institutions, and Native American groups to discuss ways of coordinating research aimed at the issues that are most relevant to conservation of the eastern North Pacific gray whale population.

On 27 December 2010 the Service published a 60-day finding for the petition (75 Fed. Reg. 81225), concluding that the petition did not present substantial information indicating that a status review may be warranted. The analyses of Punt and Wade (2010) using the revised abundance estimates from Laake et al. (2009) provided the basis for the Service's conclusion. Punt and Wade (2010) estimated the population to be at 91 percent of its carrying capacity and 1.29 times larger than its maximum net productivity level. They also estimated an 88 percent probability that the population was above the maximum net productivity level and therefore within the optimum sustainable population range.

New thinking about population structure

Scientists and managers have long subscribed to the hypothesis that there are separate eastern and western North Pacific populations of gray whales, with the currently much larger eastern population migrating along the coast of North America and the small, critically endangered western population migrating along the coast of Asia. In 2010 and 2011 satellite telemetry, photo-identification, and genetic studies provided new information on movements by gray whales between the western and eastern North Pacific. In addition, Scheinin et al. (2011) reported a gray whale in the Mediterranean Sea, again demonstrating that this species is capable of moving across large ocean basins.

The full scientific and management implications of this interchange are uncertain, the new information obtained in 2010 and 2011 has forced the scientific and management communities to re-examine previous assumptions and consider alternative hypotheses. The implications may be most significant with regard to the western population of North Pacific gray whales, which numbers about 130 individuals, and it also may be important for a collection of gray whales referred to as the Pacific Coast Feeding Aggregation. Both of those populations may be at risk from various human activities and the manner in which those activities are managed may have important conservation effects. Those implications are discussed in more detail in Chapter V of this report in the sections on the western population of gray whales and the International Whaling Commission.

Northern Sea Otter (*Enhydra lutris kenyoni*) Southwest Alaska Stock

Northern sea otters (*Enhydra lutris kenyoni)* in Alaska are managed as three separate stocks: southeast, southcentral, and southwest. As with all sea otters, the southwest Alaska stock was nearly exterminated by commercial fur hunters in the 1700s and 1800s. The International Fur Seal Treaty was signed in 1911

and banned the hunting of sea otters, but by that time only 13 isolated populations remained throughout the species' range—a range that once extended around the rim of the North Pacific Ocean from Mexico to Japan. Several of the surviving colonies were in southwest Alaska, and by the 1960s, sea otters had reoccupied their former habitat in that region (Kenyon 1969). Southwest Alaska sea otters now inhabit nearshore waters from Kodiak Island and the western side of Cook Inlet to the western tip of the Aleutian Islands, a distance of about 2,500 km.

The U.S. Fish and Wildlife Service has lead responsibility for the recovery of sea otters. Other agencies and groups, particularly the U.S. Geological Survey and Alaska Native organizations, assist with research and management activities. Because of limited funding and the extensive range of the southwest Alaska sea otter population, the Service has monitored trends in the population's abundance by surveying segments of their range. For that reason, the Service has divided the population's range into five management units: the western Aleutian Islands, the eastern Aleutian Islands, Bristol Bay along the north side of the Alaska Peninsula, the eastern end of the south side of the Alaska Peninsula, and Kodiak–Kamishak Bay–Alaska Peninsula (Figure IV-19).

Like all sea otters, southwest Alaska sea otters rarely occur in waters deeper than about 100 m, although they occasionally cross deepwater channels between island groups. Adult males may move 400 km or more, although movements of 100 to 200 km are more typical (Jameson 1989). Adult females are more sedentary and rarely move more than about 20 km (Ralls et al. 1996). Otters inhabit areas with substrates ranging from fine mud or sand to rock and feed on an assortment of benthic invertebrates (e.g., clams, sea urchins, snails, crabs, and worms) and fish.

A 1976 survey produced an abundance estimate of 94,050 to 128,650 otters in southwestern Alaska, and biologists thought the population may have approached or equaled its pre-exploitation abundance. The stock then plummeted and surveys between 2000 and 2008 indicate the current abundance of sea otters is 43 to 58 percent below the 1976 level. In some areas, the declines have exceeded 90 percent (Burn and Doroff 2005, Estes et al. 2005, U.S. Fish and Wildlife Service 2008). The greatest declines have been in the western Aleutian Islands and along the southern part of the Alaska Peninsula. At some small islands in the central Aleutians, sea otters may have disappeared entirely.

The cause or causes of the decline are uncertain. Despite some inter-annual variability in pup production, the evidence does not indicate a problem with reproduction. Instead, the more likely cause is increased mortality from one or more sources. The suspected sources include predation by killer whales, starvation, disease, oil spills, incidental take in commercial fisheries, subsistence harvests, poaching, and intraspecific aggression. The leading hypothesis is an increase in predation by killer whales (Estes et al. 1998), although what may have caused this increase is uncertain and subject to various theories about how the Bering Sea ecosystem and its food webs may have changed as a result of natural and human-caused factors.

Listing under the Endangered Species Act and development of a Southwest Alaska Sea Otter Recovery Plan

In 2005 the Fish and Wildlife Service designated the southwest Alaska sea otter stock as threatened under the Endangered Species Act. In 2006 the Service convened a Southwest Alaska Sea Otter Recovery Team to assist it in drafting a recovery plan. The team—composed of representatives from federal and state agencies, Alaska Native organizations, and the academic community—met six times between 2006 and 2008 to discuss potential recovery strategies and goals, specific recovery actions, research activities, and criteria for removing the stock from the list of endangered and threatened wildlife. In 2009 the team focused on drafting the recovery plan.

On 12 October 2010 the Fish and Wildlife Service announced that its Draft Recovery Plan for the Southwest Alaska Distinct Population Segment of the Northern Sea Otter was ready for public review (75 Fed. Reg. 62562). The draft plan outlined three main objectives: (1) achieve and maintain a self-sustaining population of sea otters in each designated management unit, (2) maintain enough sea otters to

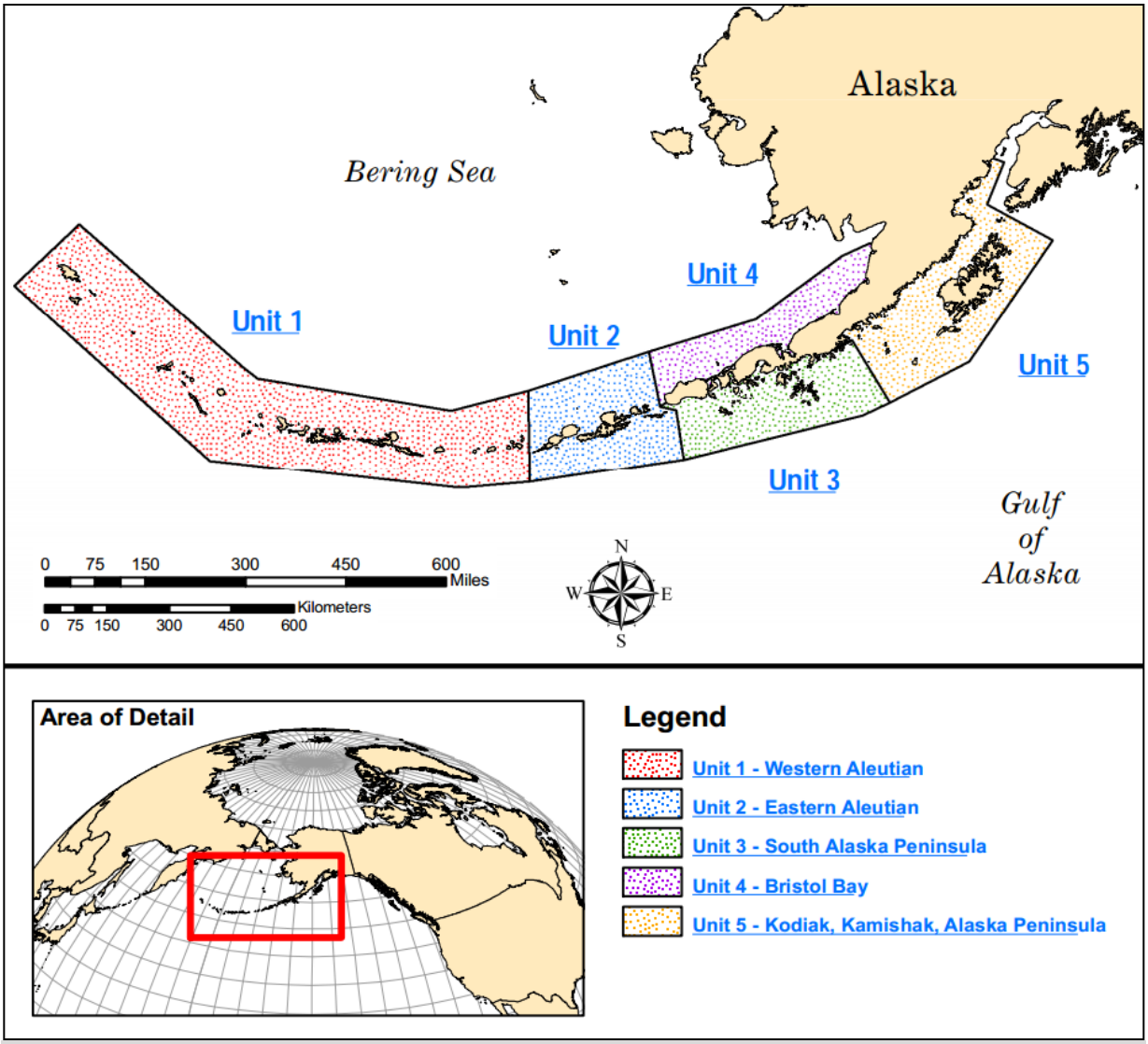

Figure IV-19. The five management units for the southwest Alaska distinct population segment of the northern sea otter, as depicted on a map of sea otter critical habitat designated by the U.S. Fish and Wildlife Service in October 2009. (Source: U.S. Fish and Wildlife Service, Alaska Region)

ensure that they are playing a functional role in their nearshore ecosystem, and (3) mitigate threats sufficiently to ensure persistence of sea otters. Each of these objectives is linked to explicit "delisting" criteria to determine if the overall recovery goals have been met; i.e., that the threats to the southwest Alaska sea otter population have been mitigated or controlled, and the population has recovered to the point where it no longer requires protection under the Endangered Species Act. The draft plan specified criteria for uplisting the stock to endangered and for delisting the stock based on the overall status of the five management units (75 Fed. Reg. 62563). The draft plan also emphasized the importance of monitoring and modeling the population and its kelp forest habitat, particularly for the western and eastern Aleutian management units. The draft plan also called for greater efforts to identify key characteristics of sea otter habitat and measures to ensure adequate oil spill response capability in southwest Alaska. Finally, the draft plan called for additional research on the impact of killer whale

predation on sea otters, which the recovery team considered the most important threat to the population and greatest impediment to its recovery.

On 8 February 2011, the Commission commented on the draft recovery plan, recommending that the Service adopt it after making several changes. First, the Commission recommended that the Service revise the draft plan by including an estimate of the total time and cost required to recover the population to the point that it can be delisted, and that it reconsider and revise its proposed approach for determining when the listing status of the southwest Alaska sea otter should be changed to endangered. The Commission also recommended that the Service revise the plan to specify the frequency for conducting population monitoring surveys of each management unit.

The Commission further recommended that the Service delete the statement concluding that the potential impact on sea otters from oil development in southern portions of the Bering Sea will be negligible and replace it with a statement that potential impacts on sea otters could range from negligible to high depending on the nature and extent of any spills that occur, and that it should update the tables in the plan's threats analysis section accordingly. The Commission also suggested that the Service expand its list of actions under Task 2.3, concerning development of an oil spill response plan, to describe (a) areas most in need of protection, (b) personnel and equipment needed to protect those areas from oil and to respond to oiled otters, (c) logistical requirements for deploying those resources and response efforts, and (d) the costs of purchasing and establishing equipment caches to meet specific sea otter response needs.

Regarding predation and disease—the other two major threats to recovery—the Commission suggested that the Service restructure its planned actions to investigate the role and significance of disease, and work with the National Marine Fisheries Service to modify Task 5.1 on predation impacts by (a) dividing the task into two subtasks, one for studies focused on sea otters and the other for studies focused on killer whales and other predators, (b) expanding the discussion under each to identify the studies that the Services believe to be of highest priority, and (c) providing cost estimates for those studies.

At the end of 2011 the Service had not issued its final recovery plan.

Proposed legislation to expand definitions of native subsistence hunting and trade

Sections 101 through 103 of the Marine Mammal Protection Act prohibit the taking and importation of marine mammals and marine mammal products, but allow certain exemptions. They include the taking of a marine mammal by any Indian, Aleut, or Eskimo who resides in Alaska and dwells on the coast of the North Pacific Ocean or the Arctic Ocean, so long as the taking is for subsistence purposes or for the purpose of creating and selling authentic native articles of handicrafts and clothing and is not done in a wasteful manner. The term "authentic native articles of handicrafts and clothing" means "items composed wholly or in some significant respect of natural materials, and which are produced, decorated, or fashioned in the exercise of traditional native handicrafts without the use of pantographs, multiple carvers, or other mass copying devices. Traditional native handicrafts include, but are not limited to: weaving, carving, stitching, sewing, lacing, beading, drawing, and painting." Existing legislation and statutory provisions under the Act are designed to draw a clear distinction between subsistence harvesting and maintenance of cottage industries based on creating and selling traditional handicrafts on the one hand, and commercial use of marine mammals on the other hand.

The stock assessment report for the southcentral Alaska sea otter population indicates that it is stable, whereas the report for the southeast population indicates it has grown substantially since it was re-introduced to this area in the 1960s and now numbers between 10,000 and 20,000 individuals.[12] Recently, the re-establishment of sea otters in southeast Alaska has sparked controversy because of the potential conflicts between sea otters and commercial and subsistence fisheries. Dive fishermen claim to have lost a total of more than $20 million to sea otter predation since the mid-1990s (McDowell Group 2011).

[12] Both reports can be found at http://alaska.fws.gov/fisheries/mmm/seaotters/reports.htm

This controversy prompted Senator Lisa Murkowski of Alaska on 29 July 2011 to introduce S. 1453, entitled "A bill to amend the Marine Mammal Protection Act of 1972 to allow the transport, purchase, and sale of pelts of, and handicrafts, garments, and art produced from, southcentral and southeast Alaska northern sea otters that are taken for subsistence purposes." As evident from its title, the bill would amend Section 102 of the Marine Mammal Protection Act to allow the transport, purchase, sale, or offer to purchase or sell, any otter pelt of the southcentral or southeast Alaska stock of sea otters taken in accordance with Section 101(b)(1). However, the primary impetus for the bill was the desire to allow increased taking of sea otters to reduce fishery-sea otter conflicts. The Bill also would allow the transport, purchase, sale, export, or offer to do any of the preceding, of any handicraft, garment, or art produced from a pelt taken from the southcentral or southeast Alaska stocks of sea otters, regardless of whether the product (a) is traditional or contemporary, or (b) is or is not altered significantly. On 30 July 2011 Representative Don Young of Alaska introduced an identical bill, H.R. 2714, in the House of Representatives. The House bill was referred first to the House Committee on Natural Resources and then to that Committee's Subcommittee on Fisheries, Wildlife, Oceans, and Insular Affairs. On 25 October 2011, the Subcommittee held a legislative hearing to discuss the merits of the bill. During the hearing, the Marine Mammal Commission provided testimony to the Subcommittee.

In its testimony, the Commission noted that H.R. 2714 would, in effect, open the door to the commercial harvesting of sea otters by allowing the sale of unaltered pelts and the export of non-traditional handicrafts, garments, and art objects. Although the initial taking would be done by Alaska Natives, nothing in the bill would prevent the sales to or subsequent creation of handicrafts, garments, or other art objects by non-Natives. The Commission also noted that H.R. 2714 would confound enforcement of the MMPA in two ways. First, enforcement officers would have no readily available basis for distinguishing between sea otters from the threatened southwest Alaska population and sea otters from the southcentral and southeast populations. Second, the bill would create two classes of handicrafts—those taken initially for subsistence purposes under Section 101 (b)(1) of the Act, and those taken specifically for the purpose of creating handicrafts under Section 101 (b)(2) of the Act. The latter group would remain subject to limitations on what items could be made and sold. The potential confusion over distinguishing between these two groups, coupled with underlying economic incentives, could result in potentially negative impacts on the affected stock.

The Commission also pointed out in its testimony that the sale of unaltered sea otter pelts within and outside the United States, coupled with the opportunity for non-Natives to obtain pelts and fashion and sell them on the open market, could undermine Alaskan Native cottage industries that currently produce and sell authentic native articles of handicrafts and clothing. Finally, the Commission testified that Section 101(a)(3)(A) of the Marine Mammal Protection Act allows the Secretary of the Interior to waive the moratorium on taking of marine mammals, provided that the taking is in accord with sound principles of resource protection and conservation and the Secretary has given due regard to the distribution, abundance, breeding habits, and times and lines of migratory movements of such marine mammals, to determine when, to what extent, if at all, and by what means, such taking may be waived. Given that the Act already contains a provision for waiving the prohibition on taking, the Commission stated its belief that the waiver process provides a better mechanism for reviewing and resolving the factors that led to the introduction of H.R. 2714.

At the end of 2011, no further actions had been taken on either the Senate or House versions of the bill.

Southern Sea Otter (*Enhydra lutris nereis*)

In North American waters south of Alaska, the only sea otters surviving the era of commercial hunting were a few tens of animals living along the remote Big Sur coast of central California. These were the remnants of a separate subspecies called the southern sea otter. In the decades following adoption of an international ban on hunting sea otters in 1911, this small colony slowly increased in abundance and

range (Figure IV-20). In 1977 the U.S. Fish and Wildlife Service listed the southern sea otter population as threatened under the Endangered Species Act to promote its recovery.

Each spring the U.S. Geological Survey (Survey) counts sea otters along their mainland range in California with the help of the California Department of Fish and Game, the U.S. Fish and Wildlife Service, and the Monterey Bay Aquarium and its volunteers. To reduce the influence of anomalously high or low counts during any single year (from variations in viewing conditions, observer experience, animal distribution and movement, etc.) the Survey uses three-year running averages of spring survey results as a more reliable way to measure changes in sea otter population abundance (Hatfield and Tinker 2012). The 2009 running average was 2,813 and the 2010 average was 2,711. The difference appeared to stem from a decrease in the number of pups (267) counted in 2010, the lowest since 2003 (Hatfield and Tinker 2012). The unusually low number of pups followed a relatively severe winter with associated periods of high surf, and the sea otter stranding network in California recovered the highest number of pups and immature otters in the 2010 spring season than during any other time within the past five years. Overall, growth of the population appears to have leveled off in the past four or five years for reasons not yet determined (Figure IV-21).

Although sea otter populations in Washington and parts of Alaska have increased at rates approaching 20 percent per year, the California population has grown at a much slower rate even in the best years, generally 5 percent or less (Estes 1990, U.S. Fish and Wildlife Service 2003). The reasons for its slower growth rate are uncertain, but possible causes include mortality from exposure to human-related contaminants and pathogens (e.g., toxoplasmosis; Miller et al. 2007) and food limitation (Tinker et al. 2008), whether from intra-specific competition, competition with other species (including humans), or loss of foraging habitat. The Survey was unable to count sea otters in the spring of 2011 because of severe weather and strong currents along the Pacific coast. Survey efforts were expected to resume in 2012.

The San Nicolas Island translocation project

In the late 1980s the Fish and Wildlife Service moved 140 sea otters from the population's mainland range to San Nicolas Island. The purpose of the move, authorized under Public Law 99-625, was to establish a separate colony that could be used to help restore the mainland colony should it be severely affected by a catastrophic event (i.e., an oil spill). San Nicolas Island lies 65 nmi offshore and is the most remote of the Southern California Channel Islands.

The translocation of the otters sparked controversy because of concern that otters from the new colony would expand rapidly and colonize other offshore islands and the mainland coast south of the existing range. Because the diet of sea otters includes shellfish important for commercial and recreational fisheries, such potential expansion raised fears that those resources would be depleted by an increase in the number of otters. To address that concern, Public Law 99-625 also required the establishment of a no-otter management zone. The zone, as designated by the Service, extended along the California coast from Point Conception southward. Otters in the management zone were to be captured and moved back to San Nicolas Island or to the area occupied by the mainland population.

In 1993 the Service suspended capture efforts in the management zone after several otters died during attempts to capture and move them. In addition, the San Nicolas colony failed to increase as expected and, in the late 1990s, it numbered fewer than 25 otters. By that time the mainland population had begun to show signs of a declining trend. In addition, a considerable number of otters were observed zone. In July 2000 the Service conducted a section 7 consultation under the Endangered Species Act on the containment component of the translocation program. The resulting biological opinion concluded that continuing containment efforts would jeopardize the population's recovery, in part by artificially restricting its range and increasing its vulnerability to the effects of oil spills, disease, and stochastic events. In January 2001 the Service therefore published a notice that it would continue its suspension of efforts to catch sea otters in the no-otter zone pending re-evaluation of the translocation program (66 Fed. Reg. 6649). In 2003 the Service adopted a Revised Southern Sea Otter Recovery Plan (U.S. Fish and Wildlife Service 2003), which advised allowing natural range expansion.

intermittently in the management

In 2005 the Service took further steps to end the translocation program when it published a draft supplemental environmental impact statement on the future of the translocation project. The preferred alternative was to declare the project a failure, terminate regulations for the sea otter management zone, allow the mainland population to expand southward naturally, and leave in place the few otters that had become established at San Nicolas Island. At the end of 2009 the count of otters at San Nicolas Island included 33 independent animals and 6 pups, slightly below the 2008 count of 37 independent otters and 5 pups. By the end of 2011, the numbers of independent sea otters counted at San Nicolas Island (i.e., non-pups) had increased to 48. The Commission has supported the Service's proposed action and, as noted in previous annual reports, recommended that steps be taken to finalize the draft statement and file a record of decision on the matter.

Figure IV-20. Current range of the southern sea otter population. The red line represents the current extent of the population's mainland range. The red dots at the northern and southern ends of the range represent observations of a single otter at that location. (Modified from Hatfield and Tinker 2012)

In 2009 the Service took no action to announce a final decision. The Navy raised concern about possible legal constraints on its exercises and activities at San Nicolas Island and perhaps elsewhere if the translocation program were ended and the sea otter colony at San Nicolas Island left in place. Because of the Service's delay in reaching a final decision, the Environmental Defense Center and the Otter Project sued the Fish and Wildlife Service on 30 September 2009 over its alleged failure to protect sea otters in the no-otter management zone. During this time, the Service continued to suspend any efforts to catch and relocate otters found in the management zone. On 23 November 2011, the parties to the litigation reached a settlement agreement. The agreement required the Fish and Wildlife Service to prepare a draft environmental impact statement on the translocation program, including a draft determination as to whether the program had failed. If the draft evaluation determined that the program had failed, the Service was to submit to the *Federal Register* no later than 1 September 2011, the text of a proposed rule to terminate the translocation program. Following a public comment period, the Service would then be required to complete a final environmental impact statement and make a final failure determination no later than 7 December 2012.

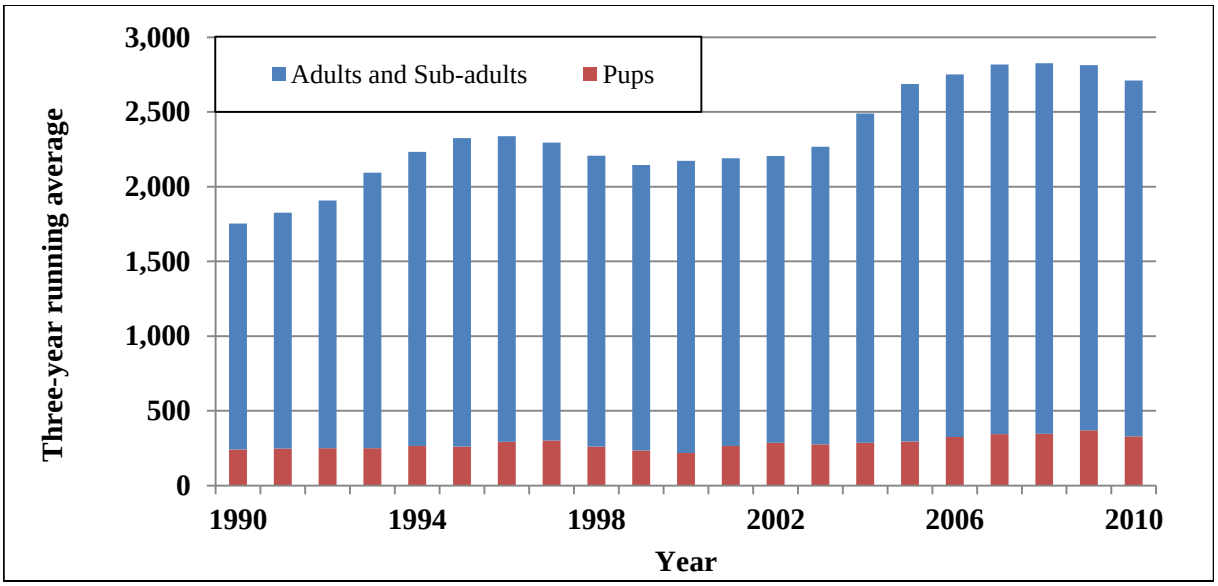

Figure IV-21. Population trends for southern sea otters based on a three-year running average of spring counts from 1990 through 2010. The three-year average is calculated using data from the current year and the two preceding years. Data are not available for 2011 because the survey was disrupted by bad weather and poor ocean conditions. (Source: Hatfield and Tinker 2012)

On 10 August 2011, the Commission provided written comments to the Service's Draft Evaluation of the Southern Sea Otter Translocation Program. The Commission recommended that, as part of a proposed rulemaking to terminate the program, the Service include proposed amendments to 50 C.F.R. §17.84(d)(8)(vi) to eliminate the requirement that sea otters at San Nicolas Island be returned to the parent population and complete that part of the rulemaking prior to making a final failure determination. The Commission had stated this same position in a 2003 letter to the Service, finding that the recovery and management goals for the species would be best served by leaving the existing San Nicolas Island population intact and on site even if the translocation were determined to have failed. Although the population may never achieve the numbers predicted at the outset of the translocation program, the population could still continue to grow to a point where it could cushion the effects of a potential catastrophic event such as an oil spill. The Commission also noted that both the recovery team and the Service's biological opinion recognized that capture and removal would pose an unnecessary risk to the San Nicolas Island otters and the population as a whole, and the applicable regulations should be amended to allow the Service to retain the existing otter population at San Nicolas Island and give it an opportunity to become fully established.

In accordance with the settlement agreement for the suit brought by the Environmental Defense Center and the Otter Project, the Fish and Wildlife Service published a notice in the *Federal Register* on 26 August 2011 (76 Fed. Reg. 53381). The notice announced the Service's finding that the translocation program had failed and that the agency was therefore proposing a rule to terminate the program. The Service's notice did not incorporate the Commission's recommendation. The agency stated that it assumed that by terminating the sea otter translocation program and revoking the regulations governing it, the regulatory requirement to return the sea otters at San Nicolas Island to their parent population also would be eliminated. On 24 October 2011, the Commission responded to the Service's notice by reiterating its recommendation that the Service amend 50 C.F.R. § 17.84(d)(8)(vi). At the end of 2011 the Service had not made its final decision on this matter.

Pending legislation

On 15 January 2009 Representative Sam Farr of California and co-sponsors introduced H.R. 556, the Southern Sea Otter Recovery and Research Act, in the U.S. House of Representatives to promote the protection and recovery of southern sea otters. The bill was referred to the House Committee on Natural Resources, which held a public hearing on its provisions in the spring of 2009. Based on results of the hearing, the bill was revised, approved by the full House of Representatives, and forwarded to the Senate for its consideration.

If enacted, the bill would have directed the U.S. Fish and Wildlife Service and the U.S. Geological Survey to implement a southern sea otter research and recovery program, including activities to monitor and analyze population ecology and health of southern sea otters, and to undertake measures that would mitigate or eliminate potential human or environmental factors affecting the population. The proposed act would authorize appropriations of up to $5 million per year between 2010 and 2015 to the Secretary of the Interior to carry out these research and management activities. It also would direct the Secretary to establish a peer review panel to provide advice on research and management priorities, reappoint a Southern Sea Otter Recovery Implementation Team, and prepare periodic reports on the status of sea otter recovery.

On 29 July 2009 the bill was referred to the Senate Subcommittee on Science, Commerce, and Transportation and considered as S. 1748, a companion bill to H.R. 556 that was introduced by Senator Boxer on 1 October 2009. On 12 December 2010, the bill was amended and reported favorably out of the Senate Subcommittee on Science, Commerce, and Transportation and placed on the Senate Legislative Calendar under General Orders. However, the Senate took no further action on the bill during the 111th session of Congress.

Steller Sea Lion (*Eumetopias jubatus*)

Beginning in the 1970s the Alaska population of Steller sea lions (*Eumetopias jubatus*) declined by over 80 percent throughout much of its range. In 1990 the National Marine Fisheries Service listed the entire species as threatened under the Endangered Species Act (55 Fed. Reg. 49204). In 1997 the Service recognized separate western and eastern distinct population segments based on geographic, demographic, and genetic information. Accordingly, it changed the listing status of the western population to endangered based on its continued decline. It did not change the status of the newly recognized eastern population (62 Fed. Reg. 24345). That population occurs from California through southeast Alaska, has increased by 2 to 3 percent annually over the past three decades, and is recovering from high levels of human-caused mortality in the years prior to the passage of the Marine Mammal Protection Act.

Causes of the western population's decline

The causes of the western population's decline have been the subject of considerable debate. Bycatch in commercial fisheries, illegal shooting by fishermen and others, the intentional killing of 45,000 pups for their fur between the mid-1960s and the early 1970s, and subsistence harvests by Alaska Natives all have contributed to the decline, but explain only a portion of it. The debate over other possible causes has been extensive and intense. The leading hypotheses include the effects of large-scale commercial fishing (e.g., prey depletion), large-scale oceanographic changes and regime shifts, and predation by killer whales (*Orcinus orca*). Because of the potential involvement of commercial fisheries, research on the decline of the Steller sea lion received extensive funding in the early 2000s, increasing from about $3 million in 1998 to as much as $56 million in 2002 and 2003 (Weber and Laist 2007), although funding has been sharply reduced in recent years. Despite the research supported by those funds, the controversy persists over the relative roles of fishing, regime shifts, and predation in the western population's decline.

The revised recovery plan

The National Marine Fisheries Service completed the first recovery plan for Steller sea lions in 1992, but that plan became outdated over the next decade as the Service gathered more information and recognized separate western and eastern populations. In 2001 it convened a recovery team to revise the recovery plan and it released a draft for public review in 2006. Appropriately, the draft dealt with the two populations separately. With regard to the western population, it identified competition with fisheries, oceanographic changes, and predation by killer whales as major threats; contaminants and incidental mortality in fisheries as moderate threats; and subsistence hunting, illegal shooting, entanglement in debris, disease, and disturbance from vessel traffic and scientific research activities as minor threats. It outlined 78 different recovery actions to assess the status of the western population, investigate remaining threats, and implement corresponding conservation measures.

The draft also highlighted three major conservation strategies for the western population: (1) maintaining current fishery management measures, (2) conducting an adaptive management approach to investigate the effects of fisheries on the ecosystem, and (3) continuing to monitor sea lion status and investigate threats. On 31 August 2006 the Commission wrote to the Service, commending the recovery team for its work and concurring with the major focus and recommendations of the plan. The Commission also recommended that the Service reconsider certain recovery criteria to address uncertainty regarding the causes of the population decline, implement a rigorous adaptive management approach for investigating the role of fisheries in the decline, and convene an implementation team to better coordinate the various ongoing and future research efforts. In 2008 the Service released its final version of the revised recovery plan.

Critical habitat

On 27 August 1993, the Service also designated critical habitat for the Steller sea lion. Critical habitat in Alaska included terrestrial rookery and haul-out areas, an air zone extending vertically 3,000 feet from the surface of rookeries and haul-out areas, an aquatic area that extended 3,000 feet seaward in federal and state waters from the baseline of all terrestrial areas, and an aquatic area extending 20 nautical miles (nm) seaward from the baseline of all major rookeries and haul-out areas west of 144 W longitude. It also included three special foraging areas located in the Shelikof Strait, Bogoslof, and Seguam Pass areas. Critical habitat in California and Oregon was designated only for the overhead air zones and aquatic areas extending 3,000 feet out to sea around rookeries (58 Fed. Reg. 45269).

A variety of the Steller sea lion protective measures implemented since the late 1990s (64 Fed. Reg. 3437) have been intended to address the effects of concentrated fishing in critical habitat. For the most part, those measures have been aimed at minimizing disturbance around rookeries and haulout sites and, especially, minimizing the potential for competition between the fisheries and sea lions for important prey species such as Atka mackerel, Pacific cod, and pollock. To avoid competition, management measures have sought to distribute fishing over space and time and thereby avoid fishery-induced localized depletions of prey, particularly in key sea lion foraging areas and particularly in winter months when sea lions—especially young sea lions learning to forage independently—may be more vulnerable to reduced availability of prey. (77 Fed. Reg. 22750).

Proposed changes to protective measures

The history of this Steller sea lion/fishery conflict has been described in detail in the Commission's reports in 2001, 2002, and 2005 through 2007. The description here focuses only on elements of that conflict in the past few years.

Of the three main hypotheses posed to explain the western population's decline, two (oceanic regime shifts and killer whale predation) are essentially beyond management control. The third hypothesis—the

effects of fishing—is not. As a result, much of the controversy surrounding sea lion recovery efforts involves protective measures aimed at avoiding or minimizing the effects of fishing.

In April 2006, the Sustainable Fisheries Division of the Service's Alaska Region reinitiated a section 7 consultation with its counterpart, the Protected Resources Division, on the potential effects of Alaska groundfish fisheries on species listed under the Endangered Species Act and their designated critical habitat in the Bering Sea and Aleutian Islands management area. The re-initiation was based on new scientific information and changes to the fisheries since 2003 (National Marine Fisheries Service 2010). The Service did not release a draft biological opinion summarizing the consultation until August 2010. The draft opinion found that protective measures implemented in the Bering Sea–Aleutian Islands region were not sufficient to prevent fishing activity from jeopardizing the continued existence of Steller sea lions or to avoid destroying or adversely modifying their critical habitat. As a result, it proposed a reasonable and prudent alternative consisting of more stringent fishery measures in areas where Steller sea lion population declines are worst—in the western Aleutian Island region in fishery areas 541, 542, and 543 (Figure IV-22). The protection measures were designed to minimize local competition between Steller sea lions and the Atka mackerel and Pacific cod fisheries in those areas, improving prey availability and foraging success, ultimately leading to increased sea lion survival and reproductive rates and, thus, population growth.

On 3 September 2010, the Commission wrote to the National Marine Fisheries Service commenting on the draft biological opinion. The Commission recommended that the Service revise the opinion to describe (1) the full extent of biomass reduction in each of the fisheries over time as projected by the proposed management strategy, (2) how these projected reductions in biomass could affect the foraging efficiency of Steller sea lions, and (3) how the reductions would still allow for recovery of the western Steller sea lion population despite the fact that no changes were required for the region's overall harvest strategy to mitigate jeopardy effects on the western population and its critical habitat. The Commission further recommended that the Service (4) analyze the shifts in the age/size distribution of prey stocks and explain how this shift could affect foraging efficiency of Steller sea lions, (5) describe changes in the distribution of prey stocks under both fished and unfished conditions, and (6) develop an adaptive, experimental approach to Alaska groundfish fisheries management. Finally, the Commission recommended that the Service (7) correct and clarify the use of the terms "recovery" and "carrying capacity" and ensure that references to recovery in the biological opinion are consistent with recovery criteria set forth in the Service's revised Steller sea lion recovery plan, and that the Service (8) analyze all of the reasonable and prudent alternatives and explain how they facilitate Steller sea lion recovery rather than just maintaining the status quo.

On 17 October 2011 the Subcommittee on Fisheries, Wildlife, Oceans and Insular Affairs, House Natural Resources Committee, held an oversight field hearing in Seattle, Washington, on NOAA's Steller sea lion fishery management restrictions and the science behind the agency's decisions. During the hearing, the Commission provided testimony in which it highlighted several long-standing concerns over the need to maintain the integrity of the Section 7 consultation process as described under the Endangered Species Act. These concerns centered around three areas: the need for transparency in information management; the need for analyses of effects to recognize cumulative effects as well as potential sources of error, and the need for a fair and open decision-making process. The Commission also noted the importance of the North Pacific Fishery Management Council during the consultation process, pointing out that the Council can serve as a conduit through which industry can provide input, and could serve as a forum for developing reasonable and prudent alternatives (RPAs) as well as research to address important uncertainties. Finally, the Commission testified on the need for the National Marine Fisheries Service to assess the ecological effects of fishing based on the maximum sustainable yield from a single target fish stock. A long-term, well-conceived, and well-planned adaptive management approach should be used to investigate the ecological effects of fishing. This issue is at the heart of ecosystem-based fishery management and the agency has yet to address it in a systematic and comprehensive manner.

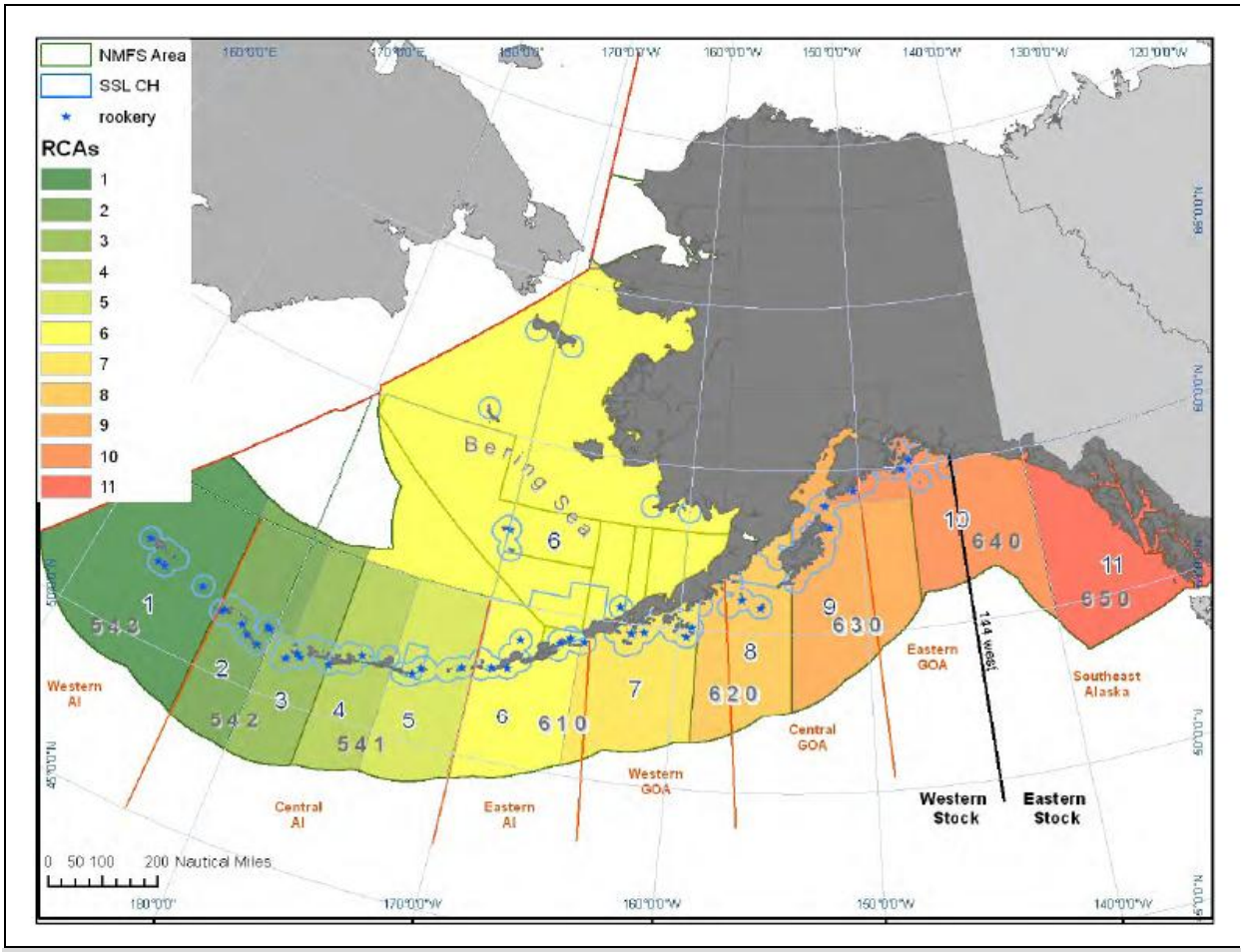

Figure IV-22. Locations of important Steller sea lion rookeries and haul-out areas and their spatial relationships to fishery management areas used by the National Marine Fisheries Service. Steller sea lion rookeries found within statistical areas 541, 542, and 543 (western Aleutian Islands) are experiencing the worst population declines. (National Marine Fisheries Service 2010)

During the public comment period on the Service's biological opinion, the Fisheries Service received over 10,000 comments, including extensive scientific reviews of the document and scientific underpinnings of the report's conclusions. The Service also requested an internal agency review of the scientific information provided in the biological opinion by scientists familiar with Steller sea lions, North Pacific Ocean ecosystems, and Alaska regional groundfish fisheries. The Service considered these comments and the internal review and made several revisions before releasing a final version of the biological opinion in November 2010. To fulfill its requirements under the National Environmental Policy Act (NEPA), the Service conducted an environmental assessment to provide evidence and analysis necessary to determine whether the proposed protection measures for the Bering Sea–Aleutian Islands management area would require the agency to prepare an environmental impact statement. On 26 November 2010, the Service reached a "Finding of No Significant Impact" determining that although the proposed actions would have an impact on people that participate in BSAI fisheries, the actions overall will not significantly impact the quality of the human environment.

In December 2010 the Service released an interim final rule (75 Fed. Reg. 77535) to implement Steller sea lion protection measures in Bering Sea–Aleutian Islands groundfish fisheries to ensure the fisheries do not jeopardize the western sea lion population or adversely modify their critical habitat. The intended measures disperse fishing effort over time and space to protect Steller sea lions from prey

competition around important rookeries and haulout areas. On 4 February 2011, the Commission issued public comments, recommending the Service implement its interim final rule and then begin the process of reexamining and modifying the specified protective measures with the goal of facilitating recovery rather than just preventing further decline. The Commission further recommended that the Service expand its section 7 consultations regarding the Alaska groundfish fisheries by analyzing the theory underlying its fishing strategy and its full ecological effects. In its letter, the Commission noted the dynamic nature of prey stocks throughout the Bering Sea–Aleutian Islands region, as well as the tendency for the Service to treat prey stocks as if they are more or less fixed in time and space. Without a fuller accounting of the ecological effects of overall fishing strategy in the Bering Sea–Aleutian Islands region, future biological opinions will remain inadequate and incomplete for their intended purposes.

Following the December 2010 announcement of the proposed interim final rule, the state of Alaska and various fishing industry entities filed legal actions against the Service in U.S. District Court, District of Alaska, seeking injunctive relief against the proposed protective measures and petitioning the court to review the Service's decision. The state of Alaska and fishing industry groups also challenged the Service's final biological opinion and its reasonable and prudent alternative under the Endangered Species Act, the finding of no significance under the National Environmental Policy Act, and the interim rule restricting fishery activity. The plaintiffs moved for summary judgment, arguing the Service's actions were substantively and procedurally flawed under the Administrative Procedure Act, Magnuson-Stevens Fishery Conservation and Management Act, Endangered Species Act, and National Environmental Policy Act (*State of Alaska* v. *Lubchenco* 2011). On 2 February 2011, two environmental non-governmental organizations, Oceana, Inc. and Greenpeace, Inc., filed a motion with the court to intervene in the case as defendants, which the court granted. The court denied a motion to intervene by two other groups, but allowed them to participate as amici curiae (volunteering to assist the court with information as needed for the case) supporting the plaintiffs' position. The court consolidated the three actions to expedite the hearing, and the case proceeded in 2011 as the interim rule and protective measures were implemented by the Service. At the end of 2011, the court was considering the plaintiffs' motion for a summary judgment and was hearing oral arguments from both sides. A final court decision was not expected until 2012.

Delisting the eastern population of Steller sea lions

On 30 August 2010 the states of Oregon and Washington submitted a petition to delist the eastern population of Steller sea lions under the Endangered Species Act. The state of Alaska submitted a second petition on 1 September 2010. On13 December 2010 the Service (1) announced its 90-day finding that the petitions presented substantial scientific or commercial information indicating the petitioned action might be warranted and (2) requested comments (75 Fed. Reg. 77602). Endangered Species Act regulations provide rules for revising the Lists of Endangered and Threatened Wildlife and Plants (50 Fed. Reg. 424). The rules state that a species, subspecies, or distinct population segment may be delisted for one or more of the following reasons: the species is extinct or has been extirpated from its previous range; the species has recovered and is no longer endangered or threatened; or investigations show the best scientific or commercial data available when the species was listed, or the interpretation of such data, was in error. The 2008 Steller Sea Lion Revised Recovery Plan[13] also called for a status review of the eastern population, noting that it (1) appears to have recovered from the predator control programs of the 20th century, (2) faces no known substantial threat, and (3) continues to increase at an average growth rate of 3 percent per year.

On 17 February 2011, the Commission submitted written comments to the Service, recommending that it proceed with delisting, but also recommending a number of steps to better investigate the status of Steller sea lions in California waters, where the southern extent of the population's range had retracted northward. The reasons for the retractions are not known, but the Service posited that they could be due to ecological changes from climate disruption, increased competition with fisheries, or growing populations

[13] http://alaskafisheries.noaa.gov/protectedresources/stellers/recovery/sslrpfinalrev030408.pdf

of California sea lions and harbor seals. The steps that the Commission recommended to the Service included—

- examining the genetic and other related information to determine if the southern portion of the eastern population is discrete and warrants management as a separate unit;
- developing or designing a strategy to track the status of the population in California waters;
- identifying possible causes of the southern range contraction and the evidence needed to prove or disprove each;
- developing a research plan to investigate the gaps in information regarding the potential causes of the contraction; and
- estimating the costs for carrying out such a plan.

Following the 90-day public comment period, the Service initiated a 12-month review to consider whether to delist the eastern population of Steller sea lions. At the end of 2011, the Commission did not expect the Service to release its proposed decision until 2012.

Incidental take authorizations for fishing activity

In November 2010 the National Marine Fisheries Service proposed to authorize the incidental take of six marine mammal stocks listed under the Endangered Species Act by groundfish fisheries in the Bering Sea and Gulf of Alaska (75 Fed. Reg. 68767). In accordance with the Marine Mammal Protection Act, the Service made a preliminary determination that incidental taking from commercial fisheries would have a negligible impact on the endangered central North Pacific stock of humpback whales, western North Pacific stock of humpback whales, northeast Pacific stock of fin whales, North Pacific stock of sperm whales, and western stock of Steller Sea lions; and the threatened eastern stock of Steller sea lions. The Service invited the public to comment on its preliminary determination of negligible impact and the Commission wrote the Service on 24 November 2010, recommending that it issue the authorization. The Commission also recommended that the Service: (1) emphasize research and monitoring programs to address uncertainties related to reproduction and survival of the far-western subpopulations of the western U.S. stock of Steller sea lions and re-evaluate the negligible impact determination as new information becomes available; (2) work with state and tribal fishery managers and participants to expand observer coverage in fisheries that may take marine mammals and, as observers provide better data, re-evaluate the negligible impact determination; and (3) identify the information gaps related to endangered and threatened species that may be affected by the issuance of the proposed authorization and elevate the priority given to addressing those gaps. The Service issued the authorization on 21 December 2010.

Polar Bear
(*Ursus maritimus*)

The polar bear, perhaps the quintessential symbol of the Arctic, is the largest species of bear (genus *Ursus*). Polar bears are distributed throughout the circumpolar Arctic in 19 populations totaling 20,000 to 25,000 bears (Aars et al. 2006, Obbard et al. 2010). The species evolved to exploit the Arctic sea ice niche and, in recent years, climate disruption has led to a rapid decrease in sea ice habitat. The projected effects of climate disruption, coupled with other threats, have raised serious concerns about the fate of the polar bear, dependent as it is on sea ice habitat and healthy populations of ice seals for prey. The risk to polar bear populations has been recognized for more than a decade and prompted the Polar Bear Specialist Group of the International Union for Conservation of Nature (IUCN) to adopt a resolution in 2001 calling for increased research into the effects of global warming (Lunn et al. 2002). In 2005 the Polar Bear Specialist Group recommended that the species' status be changed from "lower risk" to "vulnerable" based on the likelihood of an overall decline of more than 30 percent in the size of the total population

within the next 35 to 50 years (Aars et al. 2006). This threat also prompted the Fish and Wildlife Service in 2008 to list the polar bear as a threatened species throughout its range.

The Polar Bear Specialist Group periodically reviews the status of polar bear populations. Information from the most recent (2010) summary is presented in Table IV-3. Reliable abundance estimates are not available for three of the populations and the estimates for seven other populations are more than 10 years old. Of the 19 populations, the best available data indicates one is increasing, four are stable, and seven are decreasing. The best available information is not sufficient to determine the trend of the other seven populations.

Two populations of polar bears occur within the jurisdiction of the United States (Figure IV-23). The southern Beaufort Sea population numbers about 1,500 animals and ranges into Canada (Regehr et al. 2006). Although this population appeared to remain stable through the 1980s and 1990s at about 1,800 animals, it apparently declined by 20 percent to about 1,500 animals by the mid 2000s. The available information is not sufficient to confirm this statistically because of overlapping confidence intervals among the relevant studies. However, several independent observations support the hypothesis that the population is under nutritional stress due to earlier and more extensive retreat of ice in summer and later formation of ice in fall and winter. Those observations include reduced cub survival, smaller body size, poorer body condition than in the adjacent northern Beaufort Sea population, earlier emergence from dens, reduced survival of adult females in years with an extended open-water season and with sea ice farther from shore, and several occurrences of cannibalism, starvation, and incidents in which bears clawed their way through thick ice attempting to capture seals (Regehr et al. 2006, 2010; Amstrup et al. 2006; Stirling et al. 2008).

The United States shares jurisdiction of the Chukchi/Bering Seas stock with Russia (Lunn et al. 2002). The best estimate of abundance is about 2,000 bears, but this is a best-guess approximation only, unsupported by comprehensive surveys or rigorous science. Otherwise, little information is available on

Table IV-3. Abundance, trend, and relative status of the 19 polar bear populations (Source: IUCN 2010)

Subpopulation	Abundance estimate (year of estimate)	Trend	Status
Arctic Basin	Unknown	Data deficient	Data deficient
Baffin Bay	1,546 (2004)	Decline[1]	Data deficient
Barents Sea	2,650 (2004)	Data deficient	Data deficient
Chukchi Sea	Unknown	Decline	Reduced
Davis Strait	2,158 (2007)	Stable[2]	Not reduced
East Greenland	Unknown	Data deficient	Data deficient
Foxe Basin	2,578 (2010)[3]	Data deficient	Not reduced
Gulf of Boothia	1,592 (2000)	Stable	Not reduced
Kane Basin	164 (1998)	Decline	Data deficient
Kara Sea	Unknown	Data deficient	Data deficient
Lancaster Sound	2,541 (1998)	Decline	Data deficient
Laptev Sea	800–1,200 (1993)	Data deficient	Data deficient
M'Clintock Channel	284 (2000)	Increase	Reduced
Northern Beaufort Sea	1,202 (2006)	Stable	Not reduced
Norwegian Bay	190 (1998)	Decline	Data deficient
Southern Beaufort Sea	1,526 (2006)	Decline	Reduced
Southern Hudson Bay	900–1,000 (2005)	Stable	Not reduced
Viscount Melville	161 (1992)	Data deficient	Data deficient
Western Hudson Bay	935 (2004)	Decline	Reduced

[1] On-going study to validate status assessment
[2] Elizabeth Peacock (pers. comm., as cited in Vongraven and Richardson 2011)
[3] Seth Stapleton (pers. comm., as cited in Vongraven and Richardson 2011)

the trend or status of the Chukchi/Bering Seas stock. The Polar Bear Specialist Group's 2010 summary indicates that the Chukchi Sea population is "reduced" and "declining." Illegal taking in Russia may have contributed to such a decline,[14] despite the fact that hunting has been prohibited in Russia since 1956. As with the Beaufort Sea stock, this stock also has experienced a reduction in sea ice habitat in recent years (Durner et al. 2009).

Stock assessments

Section 117 of the Marine Mammal Protection Act requires the Fish and Wildlife Service to prepare stock assessments for the marine mammal stocks that it manages and that occur in U.S. waters, including the southern Beaufort Sea and Chukchi/Bering Seas stocks of polar bears. Because the polar bear is listed as a threatened species under the Endangered Species Act, these stocks are considered "strategic" and stock assessment reports are to be reviewed at least annually.

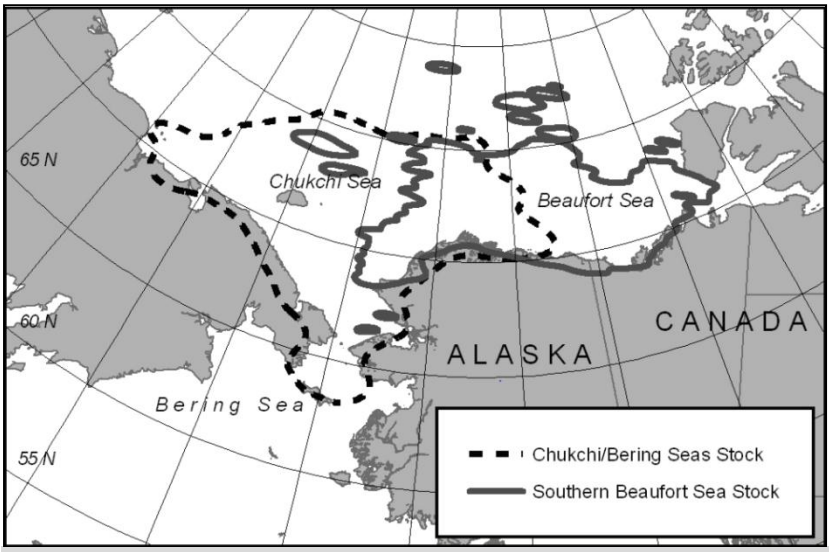

Figure IV-23. Map of the Southern Beaufort Sea and the Chukchi/Bering Seas polar bear stocks. (Source: Fish and Wildlife Service)

The Service published a notice of availability of the stock assessment reports on 30 December 2009 (74 Fed. Reg. 69139). Those reports are available on the Service's website.[15] The Service determined in 2010 and 2011 that the status of those stocks had not changed and could not be more accurately determined and, therefore, it did not update either report in 2010 or 2011.

Listing polar bears under the Endangered Species Act

In 2005 the Center for Biological Diversity petitioned the Fish and Wildlife Service to list the polar bear as a threatened species throughout its range under the Endangered Species Act. That petition contended that the polar bear "faces likely global extinction in the wild by the end of this century as a result of global warming." In analyzing the petition, the Service considered the U.S. Geological Survey analysis, which divided the range of polar bears into four ecoregions: (1) the seasonal ice ecoregion, which occurs mainly at the southern extreme of the polar bear range and includes Hudson Bay, (2) the archipelagic ecoregion consisting of the Canadian Arctic, (3) the polar basin divergent ice ecoregion, where ice is formed and then retreats from nearshore areas, especially during the summer minimum ice season, and (4) the polar basin convergent ice ecoregion, where sea ice formed elsewhere collects against the shore. Based on current conditions, projected sea ice trends, and the expected effects on polar bears, the U.S. Geological Survey, which prepared supplemental analyses, predicted population declines in western Hudson Bay (in the seasonal ice ecoregion) and southern Beaufort Sea (in the divergent ice

[14] See the 2010 stock assessment report at http://www.nmfs.noaa.gov/pr/sars/species.htm
[15] http://www.nmfs.noaa.gov/pr/sars/species.htm#fws

ecoregion) because of reduced availability of sea ice. Agency scientists predicted that polar bears could be extirpated from the polar basin divergent ice ecoregion and the seasonal ice ecoregion within the next 45 years. The results indicated that polar bears likely would be extirpated in the polar basin convergent ice ecoregion within the next 75 years. The results also predicted that polar bears in the archipelagic ecoregion likely would persist through the end of this century, but in reduced numbers.

The Marine Mammal Commission initially supported listing the species as threatened, noting that polar bears currently have a relatively large total population size and a broad distribution and that, on the whole, the species is not in immediate danger of extinction. However, the Survey's analyses convinced the Commission that declining sea ice habitat poses a significant risk of extinction to the populations in the divergent ice ecoregion and the seasonal ice ecoregion. Some populations already are in danger of extinction unless the declining trends in sea ice coverage are reversed. Therefore, the Commission recommended that the Fish and Wildlife Service list the populations in those regions (the southern Beaufort Sea, Chukchi Sea, Laptev Sea, Kara Sea, Barents Sea, western Hudson Bay, and southern Hudson Bay) as endangered. The Commission also reiterated its earlier recommendation that the Service list the polar bear populations in the other two ecoregions as threatened.

The Fish and Wildlife Service published a final rule on 15 May 2008 (73 Fed. Reg. 28212), listing the polar bear throughout its range as a threatened species. The listing rule presented detailed information on the population trends and demography of polar bears worldwide and addressed the five listing factors to be considered under section 4(a)(1) of the Endangered Species Act. The Service's analyses focused on the factor pertaining to the present or threatened destruction, modification, or curtailment of the species' habitat or range, concluding that listing was warranted based on the ongoing and projected decline of sea ice habitat and the effect that this will have on polar bear populations worldwide.

The listing decision prompted several legal challenges. The state of Alaska, hunters, and various trade associations filed lawsuits contending that polar bears did not meet the listing criteria under the Endangered Species Act. The Center for Biological Diversity and other conservation organizations sued the Service contending that a listing as endangered was warranted. Rulings in these cases are discussed later in this section.

Special rule for polar bears

If a species is listed as endangered under the Endangered Species Act, all of the prohibitions set forth in section 9 of the Act automatically apply. For species listed as threatened, however, this is not the case. Rather, section 4(d) of the Act directs the Fish and Wildlife Service to adopt such regulations as are "necessary and advisable" for the conservation of the species. The Service has the option of adopting the full suite of prohibitions applicable to endangered species or choosing a different combination tailored to the threats faced by the particular species. In the case of polar bears, the Service published an interim final rule under section 4(d) concurrent with its listing decision. Both were published on 15 May 2008 (73 Fed. Reg. 28212 and 73 Fed. Reg. 28306).

For the most part, the Service's interim rule relied on the provisions already applicable under the Marine Mammal Protection Act and the Convention on International Trade in Endangered Species of Fauna and Flora (CITES). If an activity is allowed under a permit or authorization issued under the Marine Mammal Protection Act or is subject to one of the Act's exceptions or exemptions, no additional authorization under the Endangered Species Act would be needed. This would include, for example, subsistence hunting and trade in handicrafts, cultural exchanges among circumpolar Natives, taking in defense of life or property or for the welfare of the animal, scientific research and enhancement activities, and authorized incidental taking. Similarly, no additional Endangered Species Act authorization would be needed for the import or export of a polar bear or its parts if it is authorized under a CITES permit or is allowed under one of the Convention's exceptions (e.g., for personal or household effects). If, however, one of the Marine Mammal Protection Act or CITES exceptions is not applicable, an authorization under the Endangered Species Act provisions would be required. The interim final rule also clarified that, as a consequence of the listing, certain activities that previously were permissible could no longer be

authorized, such as the taking or importation of polar bears for purposes of public display or the importation of polar bear trophies from Canada.

The interim final rule also specified that none of the prohibitions that otherwise would be applicable under its Endangered Species Act regulations will apply to the taking of a polar bear when that taking "is incidental to, but not for the purpose of, carrying out an otherwise lawful activity within any area subject to the jurisdiction of the United States, except Alaska."

Federal actions, including those carried out, funded, or authorized by federal agencies, that may affect a listed species or its critical habitat are subject to consultation under section 7 of the Endangered Species Act to ensure that they are not likely to jeopardize the continued existence of the species or destroy or adversely modify critical habitat. Although an action may affect species or habitats that occur outside the area where the action will take place (e.g., through indirect effects), the Service stated that, to meet the applicable regulatory standards, such effects must (1) be caused by the action subject to consultation and (2) be reasonably certain to occur. The Service explained that "effects are only appropriately considered in a section 7 analysis if there is a causal connection between the proposed action and a discernible effect to the species or critical habitat that is reasonably certain to occur." The Service recognized that every agency action that contributes greenhouse gases to the atmosphere arguably could trigger a consultation for polar bears or other species that are affected by climate disruption. Nevertheless, the Service thought that there was an insufficient basis for drawing a causal connection between emissions from a specific federal action and impacts on the species or its critical habitat. As such, the Service indicated that it does not intend to consult on federal actions that occur outside the polar bear's range but that could affect the species or its habitat through the release of greenhouse gases.

As discussed in previous annual reports, the Marine Mammal Commission submitted comments on the interim rule. In summary, the Commission noted that the regulations relied almost exclusively on the provisions of the Marine Mammal Protection Act and CITES to provide for the conservation of polar bears. The Commission also pointed out that those same provisions had not been sufficient to keep the species from reaching the point where it warrants listing as a threatened species. Therefore, the Commission did not see how relying on those provisions without any supplementation would satisfy the mandate of the Endangered Species Act to bring the species to the point where the Act's protective measures are no longer needed. Most notably, the interim final rule did not include any provisions specifically designed to address the primary threat faced by polar bears: the ongoing and projected loss of sea ice habitat.

The Fish and Wildlife Service published a final special rule for polar bears under section 4(d) of the Endangered Species Act on 16 December 2008 (73 Fed. Reg.76249). In most respects, the final rule tracked the provisions of the interim final rule. Minor clarifying changes were made to the provision concerning deference to authorizations under the Marine Mammal Protection Act and CITES. The one substantive change concerned the provision applicable to incidental takes. The Service adopted a recommendation made by the Commission that the exemption for such takings be revised to be applicable to all areas within the current range of the polar bear that are subject to U.S. jurisdiction, not just within Alaska.

As discussed later in this section, a federal district court invalidated the final rule on 17 October 2011 due to the Service's failure to comply with the requirements of the National Environmental Policy Act. Because of this, the 15 May 2008 interim rule regained effect. At the end of 2011, the Service was preparing a notice for publication early in 2012 announcing the reinstatement of the interim rule. Also, the Commission expected the Service to initiate a rulemaking early in 2012 to propose a new special rule for polar bears under section 4(d) of the Endangered Species Act to replace the interim rule.

Critical habitat

Section 4(b)(6)(C) of the Endangered Species Act requires that critical habitat be designated concurrent with publication of an endangered or threatened listing determination except in certain

circumstances. One of the exceptions is when the agency responsible for the listing finds that critical habitat for the species "is not then determinable," in which case it has one additional year to complete the designation process. In its final listing rule, the Service invoked this exception to extend the deadline for designating critical habitat, or determining that such a designation is not prudent, until 15 May 2009. However, under a settlement agreement reached with conservation groups, the Service extended that deadline until 30 June 2010.

The Fish and Wildlife Service published a proposed rule to designate critical habitat for the polar bear on 29 October 2009 (74 Fed. Reg. 56058). Although the polar bear is a circumpolar species and essential habitat occurs outside the United States, regulations implementing the critical habitat requirements of the Endangered Species Act (50 C.F.R. § 424.12(h)) specify that critical habitat designations are limited to areas under the jurisdiction of the United States. In accordance with this limitation, the Service proposed to designate approximately 519,403 km^2 (200,541 mi^2) in Alaska and adjacent territorial waters and waters within the U.S. Exclusive Economic Zone as critical habitat for the polar bear.

As part of its review to identify those areas containing physical and biological features essential to the conservation of polar bears, the Service identified three "primary constituent elements" meeting those criteria: (1) sea ice habitat used for feeding, breeding, denning, and movements, (2) terrestrial denning habitat, and (3) barrier islands that are used for denning and movements along the coast and that provide refuge from human disturbance. The Service determined that those areas faced potential threats from climate disruption; oil and gas exploration, development, and production; human disturbance; and commercial shipping, and therefore merited special management considerations or protection, and that each habitat type warranted inclusion in the proposed critical habitat designation. In proposing to include sea ice habitat in the proposed designation, the Service recognized that such habitat varies seasonally and from year to year and that polar bear use of such habitat is not uniform. Thus, the Service proposed to limit the inclusion of sea ice habitat to those areas over the continental shelf in waters 300 m or less in depth. The southern boundary of the proposed designation was set to correspond to the range of the Chukchi/Bering Seas population, as established by telemetry data. By far, sea ice habitat constitutes the largest area included in the proposed designation, accounting for 96 percent of the area proposed.

Two provisions of the Endangered Species Act allow the Service to exclude certain areas from a critical habitat designation. Section 4(b)(2) of the Act directs the Service to consider the economic and other relevant impacts of specifying particular areas as critical habitat and allows it to exclude such areas if it determines that the benefits of doing so outweigh the benefits of designation. Section 4(a)(3)(B)(i) of the Act directs the Service not to designate as critical habitat any lands or other areas owned or controlled by the Department of Defense or designated for the Department's use if those areas are subject to an integrated natural resources plan prepared under the Sikes Act and that plan provides benefits to the species for which critical habitat is being designated. At the time that the proposed rule to designate critical habitat was published, the Service had yet to complete its economic analysis of the impact of the proposed designation. As such, the Service did not propose excluding any areas on the basis of economic considerations. The Service indicated that it was preparing such an analysis that would be made available for public review and comment and considered in its final determination. The Service identified 11 areas operated by the Department of Defense (primarily radar installations) within the proposed critical habitat area that potentially qualified for exclusion under the second exception. The Service indicated that it would review the applicable integrated natural resources plans for these facilities to see if those plans provide benefits to polar bears.

The Marine Mammal Commission submitted comments regarding the proposed critical habitat designation on 28 December 2009. The Commission noted that, although the area proposed by the Service is large, because of considerable inter-annual variation in the distribution of different sea ice habitat types and the large ranges of individual polar bears, the entire area proposed for designation constitutes important habitat that, for one reason or another, is essential to the conservation of the species. Consequently, the Commission supported adoption of the proposed rule. The Commission agreed with the Service's determination that there currently was no need to designate critical habitat in areas outside the

existing range of polar bears. The Commission cautioned, however, that as sea ice is lost in the future, polar bears will have little choice but to move into marginal habitats. As such, less-productive areas that currently are not essential for conserving the species may become so in the future. This being the case, the Commission recommended that, once an initial designation has been finalized, the Service establish a schedule for periodic reviews to consider changes in habitat-use patterns and the need to supplement the original designation.

The Commission also reiterated a point that it had made in commenting on the proposed regulations to list the polar bear under the Endangered Species Act. The Commission took exception to the Service's view that addressing the underlying reason that the species is at risk of extinction and essential habitat is being lost (i.e., global climate disruption) was beyond the scope of the Act. In the Commission's view, failing to address this central issue is contrary to the very purpose of the Act. The fact that this is a complex, global problem does not exclude it from the Act's mandates to conserve listed species, including the polar bear, and the ecosystems on which those species depend. The Commission therefore recommended that the Service work with other key agencies, including the Environmental Protection Agency, the Department of Energy, and the Department of Transportation, to develop a coordinated strategy to identify how best to use their authorities to address climate disruption, thereby promoting the conservation of polar bears and protecting the species' essential habitat.

The Commission's comments also considered possible exclusions of certain areas from a critical habitat designation. The Commission agreed that the Service should consider exclusions of military sites based on their integrated natural resources plans but noted that, for polar bears in particular, there was a need to ensure that such plans provided adequate long-term protection for the species and its habitat. In light of the projected changes in available polar bear habitat in the foreseeable future and likely shifts in distribution, the Commission advised that any exclusion would need to be reviewed periodically to ensure that the applicable plans remain adequate to protect polar bears and to identify revisions that may be necessary to address changing and emerging threats. The Commission deferred commenting on other possible exclusions pending completion of the Service's economic analysis. It noted, however, that, just as the National Marine Fisheries Service had done in its proposed designation of critical habitat for the Cook Inlet beluga whale, the analysis of possible economic impacts from a critical habitat designation should focus on whether there are any new impediments to economic activities beyond those already caused by the requirement that federal activities not jeopardize the continued existence of listed species.

On 5 May 2010 the Fish and Wildlife Service published a notice announcing the availability of a draft economic analysis of the proposed critical habitat designation and reopening the public comment period (75 Fed. Reg. 24545). The Commission determined that there was no need to revise or supplement its previous comments based on the new information.

On 7 December 2010 the Service published a final rule designating critical habitat for the polar bear within areas under U.S. jurisdiction (75 Fed. Reg. 76086). To a large extent, the final designation tracked the Service's original proposal. It included three components—sea ice habitat, terrestrial denning habitat, and barrier islands (Figure IV-24)—but was somewhat smaller (484,734 km^2) than originally proposed. Table IV-4 summarizes the area included in the designation for each of these components. Further information and detailed maps illustrating the area designated as critical habitat can be found on the Service's website.[16]

In accordance with section 4(a)(3) of the Endangered Species Act, the Service excluded five radar sites operated by the U.S. Air Force because they are subject to integrated natural resource management plans that include measures to protect polar bears within or adjacent to those facilities. The designation also excluded certain areas in accordance with section 4(b)(2) of the Act, which allows the Service to balance whether the benefits of the exclusion outweigh the benefits of designating an area as critical habitat. Areas excluded from the designation under this provision include the Alaska Native communities of Barrow and Kaktovik and all existing manmade structures.

[16] http://alaska.fws.gov/fisheries/mmm/polarbear/esa.htm

On 1 March 2011 the Alaska Oil and Gas Association filed a lawsuit challenging the critical habitat designation. The state of Alaska and several Alaska Native corporations subsequently filed similar lawsuits. The plaintiffs contended that the scope of the area designated as critical habitat was unprecedented and included areas that are not essential to the conservation of the species, as required under the Endangered Species Act. They also asserted that the Service failed to assess the full economic impacts of the designation when weighing the costs and benefits of the designation. As such, the plaintiffs believed that the Service's analysis was faulty and that the designation would have "significant adverse ramifications for the people who live and work on the North Slope, for Alaska's oil and gas industry, and for the state of Alaska." The plaintiffs also contended that the Service improperly included areas in the designation that were not occupied by polar bears at the time of listing. The state of Alaska and Alaska Native groups also took issue with the adequacy of consultation by the Service prior to designating critical habitat. Finally, the state alleged that the Service failed to provide it with an adequate written justification for issuing a critical habitat rule that conflicted with its comments on the proposal. These lawsuits were pending at the end of 2011.

Table IV-4. Area of final designated polar bear critical habitat units (Source: Fish and Wildlife Service, 75 Fed. Reg. 76121)

Critical Habitat Unit	Estimated Size of Area in km^2 (mi^2)
Sea-ice Habitat	464,924 (179,508)
Terrestrial Denning Habitat	14,652 (5,657)
Barrier Island Habitat	10,576 (4,083)
Total Area[1]	**484,734 (187,157)**

[1] The total area is less than the sum of the three units, because the barrier islands habitat slightly overlaps the sea-ice and terrestrial denning habitat areas.

Deterrence Regulations

Polar bears frequently are found in the vicinity of villages in northern Alaska and other areas where human activities occur (e.g., around oil and gas operations). For some time, the Fish and Wildlife Service has worked with Alaska Natives to develop and implement measures for safely deterring polar bears to reduce the risks of injuries to humans and to minimize the chances that encounters will escalate to the point where bears are killed. The Service believed that it would be useful to supplement these efforts through the publication of generally applicable guidance for deterring polar bears.

Section 101(a)(4) of the Marine Mammal Protection Act authorizes individuals to take marine mammals in certain circumstances to protect property and personal safety, provided that the measures used do not result in the death or serious injury of the animal. That provision directs the Service to publish in the *Federal Register* guidelines for safely deterring marine mammals. For marine mammals listed as endangered or threatened under the Endangered Species Act, such as the polar bear, the Service is to recommend specific measures that may be used to deter animals non-lethally. The Service decided to provide this guidance through the adoption of regulations and published a proposed rule on 26 April 2010 (75 Fed. Reg. 21571).

The Commission provided comments on the proposed rule on 26 May 2010. The Commission questioned the need to provide this guidance by regulation and recommended that the Service consider less formal alternatives that would be easier to update or revise should the need arise. It also recommended that the Service consider expanding the proposed deterrence measures for bears that pose a threat to personal safety. Specifically, the Commission suggested that the Service use a stepped approach that would allow the use of crackershells and projectiles, if other measures proved ineffective, as preferred alternatives to lethal taking. The Commission also believed that there was no basis for limiting deterrence measures to U.S. citizens as the Service had proposed and recommended that this proposed requirement be deleted. Lastly, the Commission believed that the Service needed to provide additional

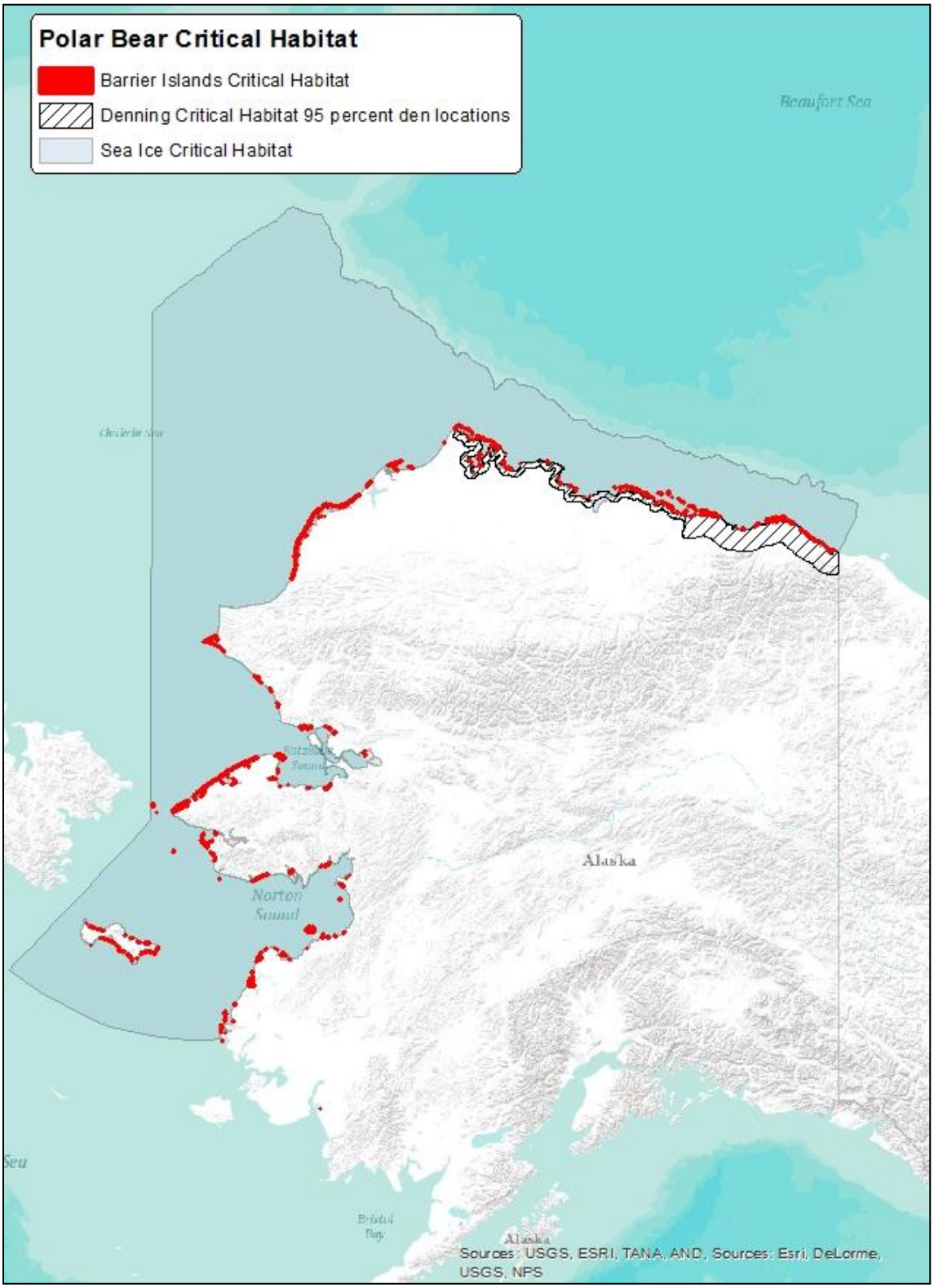

Figure IV-24. Map of polar bear critical habitat (sea ice, terrestrial denning, and barrier islands areas) designated by the U.S. Fish and Wildlife Service. (Data source: Fish and Wildlife Service)

justification for the 150 dB sound threshold that it was proposing as not being harmful to polar bears.

The Service published the deterrence guidelines for polar bears as a final rule on 6 October 2010 (75 Fed. Reg. 61631). The Service decided that regulations were appropriate because the guidelines "establish a binding norm that has the effect of law" with respect to those employing deterrence measures. The Service declined to adopt the stepped approach recommended by the Commission, noting that these guidelines were intended to apply to everyone, regardless of their level of skill, training, or ability. Although it recognized that more aggressive deterrence measures would be appropriate in some instances, the Service thought that greater familiarity with polar bears, their behavior, and likely responses was needed by those using such measures. It noted, for example, that public officials with the required training and experience already were authorized to use such measures under section 109(h) of the Act when needed to protect the welfare of the animal, protect public health and welfare, or remove nuisance bears non-lethally. The Service agreed that the guidelines should not be limited to U.S. citizens and revised the regulations accordingly. The Service also provided additional information concerning the hearing capabilities of polar bears and the sound pressure levels expected to be effective in deterring bears. Based on this information, the Service revised downward the allowable sound level to 140 dB and limited continuous use of such sources to no more than 30 seconds.

The regulations, codified at 50 C.F.R. § 18.34, authorize the use of passive deterrence measures, including rigid fencing, bear exclusion cages, and bear resistant garbage containers. The Service also authorized the use of "preventative" deterrence measures, such as acoustic devices or the use of vehicles or boats to patrol areas and block the approach of bears. The Service stressed that vehicles and boats could be used only to deter bears from entering villages, encampments, or other compounds, but not to chase bears.

Recovery plan

The Endangered Species Act requires that a recovery plan be developed and implemented for each listed species unless the Service determines that such a plan will not promote the conservation of the species. Each plan is required to include (1) a description of site-specific management actions that may be necessary to achieve the plan's goals for the conservation and survival of the species, (2) objective, measurable criteria which, when met, would prompt an action to delist the species, and (3) estimates of the time required and cost to carry out the measures to meet the plan's goal, and for achieving intermediate steps towards that goal. Efforts to develop such a plan are expected to draw on the existing polar bear conservation plan developed under the Marine Mammal Protection Act. However, the conservation plan was finalized in 1994 and will need considerable updating. For example, the conservation plan does not address impacts associated with climate disruption, which is now recognized as the primary threat to the species.

In commenting on the proposed listing of polar bears as threatened, the Commission supported the development of a recovery plan, noting that such plans generally promote the conservation of listed species. Although the Commission recognized that constituting a recovery team may be premature, it recommended that the Service make a concerted effort to identify and begin addressing management and research needs so that efforts to conserve polar bears are as timely and well informed as possible. The Commission advised the Service to consider the direct effects of climate disruption and to anticipate secondary effects, such as increased shipping in the Arctic and expanded opportunities for commercial fishing, oil and gas development, tourism, and coastal development. The Commission stressed the importance of identifying essential polar bear habitats and collecting baseline information on use of those habitats before secondary threats associated with climate disruption occur and become irreversible.

To develop a polar bear recovery plan, the Fish and Wildlife Service convened four meetings with stakeholders in 2010 and 2011. The first meeting provided an introduction to the recovery planning process and solicited general input for identifying and assessing threats to polar bears that should be addressed in the plan. The second meeting focused on actions that could be taken to mitigate potential impacts of climate disruption. The third meeting focused on actions that could be taken to mitigate

potential impacts of human-caused removals. The final meeting sought suggestions concerning the recovery criteria that would be incorporated into the plan. More detailed information about these meetings, including minutes of each meeting, is available on the Service's web site.[17] Representatives of the Marine Mammal Commission were able to participate in the first two meetings.

At the end of 2011 the Service was working on a draft plan that it expected to make available for public review and comment late in 2012 or early in 2013.

Trophy imports

The 1994 amendments to the Marine Mammal Protection Act allow the Secretary of the Interior to issue permits authorizing the importation of polar bear trophies from sport hunts conducted in Canada, provided that certain findings are made. Among other things, the applicable provision (section 104(c)(5)) requires the Secretary to find that Canada has a monitored and enforced sport hunting program that is consistent with the purposes of the Agreement on the Conservation of Polar Bears[18] and the Marine Mammal Protection Act and based on scientifically sound quotas that will ensure the maintenance of the affected population stock at a sustainable level. Imports of trophies had been approved from 6 of 13 management units identified by Canada. Imports from a seventh management unit (M'Clintock Channel) also had been approved but only for bears that were legally harvested prior to 1 April 2000 when the sustainability finding was revoked. Imports from the other management units never were authorized except under a grandfather provision that allowed the importation of any polar bear trophy legally taken in Canada before 18 February 1997, the date on which the Fish and Wildlife Service published regulations implementing the polar bear import provision.

All of this changed, however, when the Fish and Wildlife Service listed the polar bear as a threatened species. Under the statutory definition of "depletion," any species or population of marine mammal listed as endangered or threatened under the Endangered Species Act is automatically considered to be depleted under the Marine Mammal Protection Act. In accordance with section 102(b)(3), depleted marine mammals may be imported into the United States only for purposes of scientific research or for enhancing the survival or recovery of the species or stock. In an opinion issued by the Department of the Interior's Solicitor on 23 May 2008,[19] the agency determined that this general import prohibition took priority over the specific permit provision applicable to polar bear trophies. The opinion concluded that "Congress did not intend to allow the importation of sport-hunted polar bear trophies from Canada under section 104(c)(5) of the MMPA if polar bears were listed as a threatened species or endangered species under the ESA." The Solicitor noted, however, that the Service can still authorize the importation of polar bear parts under scientific research or enhancement permits, provided that all of the applicable statutory and regulatory requirements have been satisfied. Consistent with the Solicitor's determination, the Service suspended its review of pending applications for trophy import permits and informed those who had been issued import permits but had yet to import their trophies that those permits were no longer valid. Some of the hunters whose import permit applications were pending at the time of the listing, as well as hunting organizations, filed lawsuits challenging the Service's determination. As discussed in the next section, the district court ruled that the Service's determination was correct—the listing of the polar bear as threatened precluded further imports of sport-hunted trophies under the Marine Mammal Protection Act.

Litigation

The Service's listing of polar bears and issuance of the special rule almost immediately spawned a variety of legal challenges. Conservation groups contended that the species should have been listed as

[17] http://alaska.fws.gov/fisheries/mmm/polarbear/esa.htm#recovery_plan

[18] A 1973 agreement to prohibit unregulated sport hunting of polar bears, signed by Canada, Denmark, Greenland, Norway, the U.S.S.R., and the United States

[19] http://www.doi.gov/solicitor/opinions.html (see section M-37015)

endangered rather than threatened. The state of Alaska and others claimed that listing polar bears as threatened was unwarranted. Hunters who had applied for or had been issued trophy import permits challenged the Service's interpretation that such imports could no longer be authorized. Litigants also challenged the special rule, some contending that it should have incorporated all of the protections afforded species listed as endangered and others that it had been too inclusive of those prohibitions. All of the cases, which originally had been filed in multiple judicial districts, were consolidated into a single case to be considered by Judge Emmet Sullivan in the U.S. District Court for the District of Columbia.

Judge Sullivan issued his first ruling on 30 June 2011 (*In re Polar Bear Endangered Species Act Listing and § 4(d) Rule Litigation*), upholding the listing of polar bears as threatened. Applying the deferential standard of judicial review applicable to listing decisions, the court found that the Service had applied a permissible interpretation of the term "in danger of extinction" as applied to polar bears. In assessing the claims of conservation groups that some or all of the populations of polar bears should have been listed as endangered, the judge noted that "[a]lthough the evidence emphasized by [those groups (which included the Commission's recommendation that some populations be listed as endangered)] is troubling, the Court finds that the agency acted well within its discretion…in reaching its conclusion…." The judge continued that, while those groups "would have weighed the facts differently, the Court is persuaded that [the Service] carefully considered all of the available scientific information before it, and its reasoned judgment is entitled to deference."

The judge also found that the Service had acted reasonably when it used three generation cycles (45 years) to define what constitutes the "foreseeable future" in assessing whether the polar bear should be listed as threatened (i.e., "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range"). Similarly, the court ruled that the Service had not acted irrationally when it declined to consider any populations or bears within any ecoregion as sufficiently discrete to qualify as a "distinct population segment," which would merit separate consideration for listing. This is an issue raised by parties on both sides to bolster claims that at least some populations should have been considered for listing as endangered, or conversely, should not have been listed at all.

Judge Sullivan issued two separate opinions on 17 October 2011 addressing the remaining issues in the case. The first of these considered both substantive and procedural challenges to the special rule for polar bears issued under section 4(d) of the Endangered Species Act. Conservation groups contended that the rule violated the Act because it failed to provide for the conservation of the polar bear. Specifically, the plaintiffs claimed that the rule was wanting in that it did not address the issue of greenhouse gas emissions, which had been identified by the Service as the cause of increasing temperatures in the Arctic and the predicted loss of the polar bear's sea ice habitat. Conversely, the Service determined that regulations under section 4(d) would not be a useful or appropriate tool to alleviate that particular threat. Although sympathetic to arguments that a strong mechanism to combat the effects of global climate disruption is needed, the court nevertheless believed that the Service's conclusion that the rule provides for the conservation of polar bears even without reversing the trend of sea ice loss was not arbitrary, capricious, or contrary to law.

Conservation groups also challenged the 4(d) rule based on alleged violations of the National Environmental Policy Act (NEPA), arguing that the Service should have prepared an environmental impact statement on the rulemaking. The Service believed that the issuance of special rules for threatened species is exempt from NEPA and contended that, even if those requirements apply, issuance of the polar bear rule did not qualify as a "major federal action significantly affecting the quality of the human environment." The court disagreed with the Service's position and determined that there is no broad NEPA exemption for such rules. Moreover, the judge ruled that, at a minimum, the Service was required to conduct an initial assessment of the rule to determine whether preparation of a full environmental impact statement is needed. Because it had not done so, the court vacated the rule pending completion of a new rulemaking and preparation of a NEPA analysis. The court determined that the interim final rule adopted at the time of listing, which had not been challenged by the plaintiffs, would be reinstated pending completion of a new rulemaking.

The second opinion issued by the district court on 17 October 2011 addressed the complaints filed by Safari Club International, Conservation Force, and individual hunters challenging the Service's determination that listing the polar bear as threatened precluded the importation of sport-hunted trophies from Canada. These plaintiffs argued that the more specific provision of the Marine Mammal Protection Act concerning trophy imports (section 104(c)(5)) took precedence over the more general prohibitions concerning the importation of depleted species. Furthermore, they contended that the Service had not properly designated the polar bear as a depleted species under the Act. The court was not persuaded by these arguments. It ruled that under the Act's definition of a depleted species, a species listed under the Endangered Species Act automatically is considered depleted. No further action or notice is required. Further, the judge concluded that the Service was correct in its finding that, because the species is depleted, sport-hunted polar bear trophies no longer are eligible for import. Sport-hunting is not among the narrow, specific exceptions to the Act's ban on taking and importing depleted marine mammals.

Native subsistence hunting

The Marine Mammal Protection Act authorizes Alaska Natives to take marine mammals for subsistence uses and for purposes of making and selling authentic Native articles of handicrafts and clothing. Subsistence hunters take polar bears from both stocks that occur in Alaska (Table IV-5). The Fish and Wildlife Service's marking and tagging program has provided data on the number of polar bears taken since 1988, the year that program was instituted. Under the program, Alaska Native hunters are required to report, within 30 days, on each polar bear taken and to present the animal's skin and skull for tagging. The Service has established a network of "taggers" located in each of the hunting villages who tag the bear parts and measure the skull size, determine the sex of the bear, record the location where the bear was taken, and collect a tooth for aging.

The number of bears taken from the Chukchi/ Bering Seas stock has declined since the 1980s. The average annual take in the 1980s was 92, about 50 per year during the 1990s, and about 33 per year over the past 10 years. The causes for this reduction are not well understood but may be related to (1) changing climate conditions and the altered duration, extent, movement, and thickness of the sea ice in the area, (2) a population decline, (3) the suspected but not quantified increase in the number of bears taken from this population in Russia, thus reducing the number of bears available to hunters in Alaska, and (4) a decline in the number of active Native hunters. In 2009 and 2010 the number of bears taken from this population for subsistence by Alaska Natives dropped to the lowest levels on record, but jumped back up in 2011.

Scientists have yet to produce a reliable quantitative estimate of abundance for the Chukchi/Bering Seas stock. The most recent estimate of 2,000 animals is based on expert opinion, and the IUCN Polar Bear Specialist Group recently identified the size of this population and its trend as declining. Up-to-date and reliable data are needed on bear recruitment, survival, and movement patterns. As noted earlier, questions remain about the number of polar bears being removed by hunters in Russia, where hunting currently is prohibited but illegal kill levels may be substantial. To address these concerns, the United States and Russia have concluded a bilateral agreement to conserve this stock, set hunting limits, and provide a vehicle for cooperative research. Efforts to implement that agreement are described in the following section. studied and maintained in good health. However, cub survival and the body condition of bears age three and older in this population have declined over the past 25 years, coinciding with a decline in the availability of preferred ice habitats (Rode et al. 2007). This prompted the parties to the agreement in 2010 to reduce the approved harvest level from 80 to 70 bears per year, apportioned evenly between hunters in Canada and the United States.

Taking levels from the Beaufort Stock show less inter-annual variation than from the Chukchi/Bering Seas stock and have remained between 14 and 18 bears per year between 2007 and 2011. It is not clear why hunting activity in this area has been more constant, but the reason may reflect management of this stock under the North Slope Borough/Inuvialuit Game Council agreement. However, recent harvests in the United States remain well below the authorized levels under that agreement.

International polar bear agreements

Polar bears can traverse great distances, often crossing national boundaries and moving into international waters. This being the case, efforts to conserve them often require international cooperation. The United States participates in both multilateral and bilateral agreements to conserve polar bears.

Agreement on the Conservation of Polar Bears: As noted earlier, polar bears occur throughout the Arctic. In the 1950s and 1960s hunters were taking an increasing number of polar bears. For that reason, the United States and other countries where polar bears occur negotiated the multilateral Agreement on the Conservation of Polar Bears. The agreement was concluded in 1973 by the governments of Canada, Denmark (for Greenland), Norway, the Soviet Union, and the United States; it entered into force in 1976. Among other things, the agreement limits the purposes for which polar bears may be taken, prohibits certain methods of taking, and requires the parties to protect important bear habitats, such as denning and feeding areas and migratory corridors. It also requires signatory countries to maintain national research programs. Implementation of the agreement by the United States relies on domestic legislation, primarily the Marine Mammal Protection Act.

The Agreement on the Conservation of Polar Bears also calls on the party nations to consult with one another to further the conservation of polar bears and to exchange information concerning their research and management programs, particularly with respect to shared populations. However, until recently, the party nations had not established a formal mechanism for consulting and had met only rarely. Rather, for the exchange of information they relied largely on the IUCN's Polar Bear Specialist Group, which is composed of polar bear experts from the five polar bear range states. The Specialist Group meets periodically, usually every three or four years, to review matters pertaining to research and management of polar bears and to provide scientific advice and technical support that can be used by the contracting governments to implement the agreement.

Table IV-5. Numbers of polar bears reported taken by Alaska Natives, 1980-2012 (Data source: U.S. Fish and Wildlife Service)

Harvest Year	Alaska Total Take	Southern Beaufort Sea	Alaska Chukotka
1980	84	39	45
1981	109	27	82
1982	52	24	28
1983	167	41	126
1984	242	72	170
1985	109	33	76
1986	137	35	102
1987	119	33	86
1988	153	47	106
1989	83	39	44
1990	107	25	82
1991	88	30	58
1992	79	36	43
1993	92	49	43
1994	111	29	82
1995	80	19	61
1996	68	57	11
1997	79	39	40
1998	51	19	32
1999	120	30	90
2000	54	24	30
2001	106	41	65
2002	110	44	66
2003	73	43	30
2004	47	32	15
2005	78	37	41
2006	77	25	52
2007	69	17	52
2008	39	18	21
2009	31	17	14
2010	26	14	12
2011	60	18	42
2012	76	23	53
Average	**90**	**33**	**58**

In 2007 the United States called for a meeting of the parties to exchange information on polar bear research and management programs, review the status of polar bear populations, and consider additional measures that the parties could take to strengthen polar bear conservation programs. The United States hosted the meeting in Shepherdstown, West Virginia, in June of that year. This was the first time that the parties to the 1973 polar bear agreement had met since 1981. The participants considered the opportunity to discuss polar bear conservation needs to be valuable and agreed that more frequent meetings were needed to assess and oversee implementation of the polar bear agreement. They agreed to hold meetings biennially or as otherwise scheduled by the parties.

The parties met next in 2009 in Tromsø, Norway. Participants at that meeting identified climate disruption as the most important long-term threat to polar bears but recognized that actions needed to mitigate that threat are beyond the scope of the polar bear agreement. Nevertheless, the parties expressed concern that their obligations to conserve polar bears and to protect the ecosystems upon which polar bears depend can be met only if global temperatures do not rise to the point where sea ice retreats from extensive parts of the Arctic. Consistent with this view, the range states identified an urgent need for an effective global response to climate disruption and recommended that the significance of climate disruption to polar bears be brought to the attention of those working in other fora in which strategies to address the issue are being negotiated. The polar bear range states concluded that, absent an effective response to projected sea ice loss, the best available management strategy would be to reduce other stressors to polar bears and their habitats to the extent possible. Although of less importance than climate disruption, the parties identified several other threats to polar bears, including habitat loss, overharvesting, contaminants and pollution, disturbance from industrial development and other human activities in Arctic areas, and increased shipping as ice-free periods lengthen.

To respond to these threats, the parties agreed to develop a coordinated approach for identifying and implementing needed conservation and management measures. The first step would be for each range state to develop a national action plan, with the expectation that such plans would be integrated to form a comprehensive circumpolar plan. The parties expected that significant progress would be made toward drafting national plans before the next biennial meeting. Participants at the Tromsø meeting also recognized the value of the Polar Bear Specialist Group in meeting their research and coordination obligations under the agreement and asked the specialist group to serve as the scientific advisory group to the parties.

The parties to the Agreement held their next meeting in Iqaluit, the capital of the Canadian territory of Nunavut, on 24-26 October 2011. Each country provided an update on steps that it had taken to develop its national action plan. The United States discussed progress being made to draft a recovery plan for the species, which to a large extent will serve as its national action plan. While recognizing that increasing greenhouse gas emissions are the primary threat to polar bears, the United States described actions being taken to minimize other impacts, most notably those from interactions between people and bears. Russia reported that it had completed a Strategy for Polar Bear Conservation, approved by its Ministry of Natural Resources on 5 July 2010. Norway explained that it had a comprehensive legal and policy framework in place to manage polar bears on Svalbard and in the Barents Sea, including the designation of protected areas. Greenland noted that it was continuing to work on its national action plan, and described several steps that it already was taking to conserve polar bears. These included the adoption of new quotas, which have stabilized harvest rates. Canada stated that its national polar bear conservation strategy had been developed and was awaiting signature by federal, provincial, and territorial ministers, and by the relevant wildlife management boards.

The parties discussed a draft table of contents for integrating national action plans into a single range-wide circumpolar action plan. Among the key recommendations that emerged were the need to—

- incorporate an adaptive management approach to respond to ongoing and predicted changes to Arctic ecosystems and human activities in those areas;
- balance polar bear conservation with the needs of communities within the polar bear range;
- base decisions on the best available science and on traditional ecological knowledge;

- ensure the engagement of affected indigenous peoples in management actions; and
- follow a precautionary principle.

Members of the Polar Bear Specialist Group provided recommendations on how the table of contents for the circumpolar action plan might be improved. Among other things, the Specialist Group noted that a lack of capacity and shortage of funds are serious challenges to polar bear research and management. It therefore saw a need for the plan to set priorities among the identified threats and planned actions. The Specialist Group also provided the range states with a draft science chapter for inclusion in the action plan as requested by the parties in 2010. The draft noted that effective management and conservation of polar bears will require an integrated pan-Arctic research and monitoring effort to improve our ability to detect ongoing patterns and predict future trends, identify the most vulnerable populations, and provide managers with independent advice based on the best available scientific information. The text of the draft science chapter is available on the Polar Bear Specialist Group's web site.[20]

On a related point, the parties also discussed the adoption of a circumpolar monitoring plan for polar bears. As discussed in Chapter X of this report, the Marine Mammal Commission funded the preparation of this plan under the supervision of the Polar Bear Specialist Group. The original intent was for the plan to be adopted by the Circumpolar Biodiversity Monitoring Program of the Arctic Council's Conservation of Arctic Flora and Fauna working group. However, some members balked at that idea because that organization has no management authority for polar bears. Although generally supportive of the plan, the working group thought that it would be more appropriate for the plan to be referred to and considered by the parties to the Agreement on the Conservation of Polar Bears.

Because the Marine Mammal Commission had supported the development of the plan, its representative on the U.S. delegation introduced the plan at the Iqaluit range states meeting, asking that it be considered for adoption. Recognizing that its development had been spurred in large part by recommendations made at their 2009 meeting in Norway, the parties welcomed the opportunity to review the plan. Some delegations questioned whether traditional ecological knowledge had been sufficiently integrated into the plan, and thought that more time was needed to review it and to consult with Native groups before endorsing the plan. The parties agreed to pursue the necessary consultations and tasked the Polar Bear Specialist Group with providing recommendations as to which elements of the monitoring plan should be incorporated into the circumpolar action plan that the range states will consider at their 2013 meeting.

United States–Russia Polar Bear Agreement: In the early 1990s the Fish and Wildlife Service began discussions with its Russian counterparts to develop a unified management approach for the Chukchi/Bering Seas polar bear stock shared by the two countries. Those discussions culminated in the two countries signing a protocol in 1992 expressing their intent to pursue a joint management agreement. The 1994 amendments to the Marine Mammal Protection Act provided further impetus for a bilateral polar bear treaty. Section 113(d) of the Act called on the Secretary of the Interior, acting through the Secretary of State and in consultation with the Marine Mammal Commission and the state of Alaska, to consult with Russian officials on the development and implementation of enhanced cooperative research and management programs for the shared stock. In October 2000 efforts to pursue greater cooperation between the United States and Russia with respect to the Chukchi/Bering Seas polar bear stock culminated with the signing of the Agreement between the Government of the United States of America and the Government of the Russian Federation on the Conservation and Management of the Alaska–Chukotka Polar Bear Population. The agreement specifies that subsistence taking by Native residents of Alaska and Chukotka is to be the only allowable consumptive use of the affected stock of polar bears. It establishes a joint commission composed of a governmental official and a representative of the Native people from Russia and the same from the United States. The bilateral commission is to establish annual taking limits that may not exceed the sustainable harvest level determined for the stock. The allowable take will be divided equally between the two parties, but, subject to approval by the commission, either

[20] http://pbsg.npolar.no/en/news/archive/2011/Iqaluit-2011.html

party may transfer a portion of its allowable take to the other party. Once in place, the commission is to establish a scientific working group to assist in setting annual sustainable harvest levels and identifying scientific research to be carried out by the parties.

Other provisions of the agreement prohibit the taking of denning bears, females with cubs, or cubs less than one year old and the use of aircraft and large motorized vessels for hunting polar bears. Also, the agreement directs the parties to undertake all efforts necessary to conserve polar bear habitats, particularly denning areas and those areas where polar bears concentrate to feed or migrate. Implementation of these provisions is expected to help ensure that the United States is in full compliance with the provisions of the multilateral 1973 polar bear treaty. Additional information concerning the Chukchi/Bering Seas polar bear stock and the treaty can be found at the web site maintained by the Fish and Wildlife Service's Alaska Region.[21]

Implementation of the bilateral agreement by the United States is governed by Title V of the Marine Mammal Protection Act, enacted as section 902 of Public Law 109-479 in 2007. That legislation provides domestic authority to carry out U.S. responsibilities under the agreement. Among other things, Title V—

- set forth the procedures by which U.S. commissioners are selected,
- established prohibitions on taking polar bears in violation of the U.S.–Russia agreement or any annual limit or other restriction on the taking of polar bears adopted by the parties to that agreement,
- relied on the existing authorities under Title I of the Act for enforcement,
- directed the Secretary of the Interior to promulgate regulations to implement the provisions of the Act and the agreement,
- authorized the Secretary to share authority for managing the taking of polar bears with the Alaska Nanuuq Commission,
- allowed the United States to vote on issues before the U.S.–Russia Polar Bear Commission (to be established under the agreement) only if the two U.S. commissioners have no disagreement on the vote, and
- authorized appropriations to carry out functions related to the agreement through fiscal year 2010.

The polar bear commission held its first meeting in September 2009. The adoption of rules of procedure to govern operation of the commission was a main topic of discussion. The parties agreed to hold annual meetings alternating between the two countries as the host nation. The parties also agreed that, in general, the commission would meet in open session and that observer status may be accorded to representatives of political subdivisions of the two countries, non-governmental organizations, and intergovernmental organizations that demonstrate an ability to contribute to the commission's work. The Alaska Nanuuq Commission and the Association of Traditional Marine Mammal Subsistence Hunters of Chukotka were granted permanent observer status. The commission also took note of the importance of the Agreement between the Native Peoples of Alaska and Chukotka Regarding the Conservation and Use of the Alaska-Chukotka Polar Bear Population and agreed to receive and consider recommendations from the joint committee established under that agreement.

Article VII of the agreement requires the commission to establish a scientific working group and allows it to establish other working groups as necessary. At the 2009 meeting, the commissioners agreed that, for the time being, only the scientific working group would be established. The parties agreed that the scientific working group would consist of 10 members, 5 from each country. The United States indicated that its members would include a habitat expert, a polar bear ecologist, a population biologist, a senior scientist, and someone with expertise in Native traditional ecological knowledge. The commission tasked the working group with providing guidance on a variety of scientific matters related to the

[21] http://alaska.fws.gov/fisheries/mmm/polarbear/issues.htm

commission's work, foremost among those being the formulation of recommendations concerning annual sustainable harvest levels and annual take limits.

The parties to the agreement deferred adopting any harvest levels pending the receipt of advice from the scientific working group. The commissioners agreed to maintain the status quo until its next annual meeting, with the United States continuing to allow hunting in accordance with the subsistence provisions of the Marine Mammal Protection Act and Russia retaining its ban on all hunting under a 1956 law.

The parties held their second meeting on 7-9 June 2010 in Anchorage, Alaska. Although the parties considered a wide variety of conservation-related issues, they focused attention primarily on identifying a sustainable harvest level. The scientific working group had met before the meeting and recommended a harvest quota of 45 bears to be shared by the two countries. Three of the four commissioners initially expressed support for adopting the recommended level. The Alaska Native Commissioner, however, thought that the recommended level was too low and unnecessarily conservative. He suggested setting the sustainable harvest level at 68 bears annually for a four-year period. This, he thought, would be consistent with the recommendations of the scientific working group, if one assumed a population size of 2,000 bears and a maximum potential growth rate for the population of 6 percent. Some Native participants on both sides and the representative of the state of Alaska supported this higher quota. The Marine Mammal Commission's representative on the delegation, however, questioned the scientific basis for this higher quota, noting that using a presumed growth rate of 0.06 is unrealistically high for polar bears in general and especially so for the Chukchi/Bering Seas population.

The U.S. Commissioner chairing the meeting put forward a compromise proposal. He suggested that the annual harvest limit be set at 58 bears under a five-year block quota of 290 bears, with no more than 68 bears to be taken in a given year. Consistent with the scientific working group's recommendation, the proportion of females in the harvest should not exceed one third (i.e., a 2:1 male to female ratio in the harvest each year). Under this proposal, the scientific working group would review the allowable harvest level each year and either confirm that it remains appropriate or recommend adoption of a new quota.

The head of the Russian delegation responded that he could not accept that option because it had not been considered and approved by the scientific working group. A recess was called while those members of the scientific working group in attendance (7 of 11 members) met in an ad hoc session to consider the new proposal. They concluded that the short-term impact of authorizing the removal of 58 bears per year would not be significantly different than the originally-proposed level of 45—it would translate in an additional harvest of only about four more female bears per year.

Based on this new analysis, the Commission approved an annual take of up to 58 polar bears per year, of which no more than 19 can be females. The parties agreed to defer implementation until the necessary legislative and enforcement mechanisms are in place. The parties also confirmed that all human-caused removals (e.g., bears taken illegally or in defense of life) would be counted against the quota. Representatives of the two countries were directed to identify the harvest seasons that would be established on each side. Each country also agreed to develop a plan for implementing a regulated harvest to be discussed at the next meeting of the parties.

The Marine Mammal Commission's representative at the meeting acknowledged the importance of that decision. Once implemented, the new quota would, for the first time, place enforceable limits on the number of polar bears that can be taken by Alaska Natives for subsistence. Equally significant, the decision would allow the legal taking of polar bears by Russian Natives for the first time in more than 50 years. However, he expressed reservations over the scientific basis for the quota. Although a quota of 58 bears might be supportable on an interim basis, he cautioned that a more rigorous review of the science underlying that quota is needed.

In response, the bilateral Commission agreed that the scientific working group would conduct an annual review of this harvest limit and make recommendations confirming continuation of the limit or specifying a new limit. The Commission also tasked the working group with formulating recommendations on how the new limit would be administered, including consideration of multi-year harvest limits.

The other key action taken at the 2010 meeting concerned the need to develop a cooperative research plan. Russia stated that the parties need to develop not only a compatible harvest monitoring and regulatory systems, but also a cooperative research program to provide the information on which harvest limits are based. The United States and the chair of the scientific working group concurred. However, the parties did not specify a process or timetable for developing such a plan.

The parties to the bilateral agreement next met in Moscow on 27-29 July 2011. The scientific working group held a meeting on 26 July in conjunction with the Commission meeting. The working group made recommendations concerning the adoption of a multi-year harvest management system that would reflect the life history of polar bears and the inter-annual variability in subsistence hunting. The proposal highlighted the need to establish upper limits both on the total number of bears and the number of female bears that could be taken in a given year. It also identified the desirability of addressing both credits and debits that could be carried over into future years, such that a certain number of unused hunting opportunities could be carried forward to the subsequent year or that reductions would be made if the annual allocation were exceeded. The Commission approved the recommendation that a multi-year quota system be introduced for an initial five-year period, and asked the scientific working group to develop a more detailed proposal for consideration at the next Commission meeting.

The Commission also adopted two other recommendations from the scientific working group. To address concerns that the working group needed to incorporate traditional ecological knowledge into its deliberations, the Commission decided to expand the size of the working group to include Native representatives. The United States was allowed to add two members from the North Slope Borough and Russia a representative from the Union of Marine Mammal Hunters. Following up on the discussion at the previous Commission meeting, the working group recommended that a joint United States-Russia research plan be developed. The Commissioners agreed and tasked the scientific working group with developing the plan.

The two countries provided updates on the steps being taken to establish mechanisms to implement, monitor, and enforce the authorized harvest levels. On the U.S. side, the Fish and Wildlife Service is working to conclude a cooperative management agreement with the Alaska Nanuuq Commission. The Russian representatives expressed interest in developing a similar program and, in response, the parties agreed to hold a joint workshop in Chukotka to support development of a Russian plan.

The Commission also believed that it would be useful to develop a public outreach strategy to disseminate information about its activities. Toward this end, it established a working group to develop press releases, a web site, and other materials for distribution. As an interim step, the parties agreed to post documents on the web site maintained by the Government of Chukotka. The parties agreed to hold the next meeting in Anchorage, Alaska, in June 2012.

Convention on International Trade in Endangered Species of Wild Fauna and Flora: The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) regulates international trade in animal and plant species that are threatened with extinction or may become so if trade is not controlled. Although not specific to polar bears, CITES contributes to the conservation of polar bears, which are listed on Appendix II to the Convention, by controlling international trade.

In preparing for the 2010 Conference of Parties to CITES, the Fish and Wildlife Service, which has primary responsibility for implementing CITES for the United States, published a notice in the *Federal Register* seeking recommendations on a proposal that it might put forward. In line with its listing of polar bears as threatened under the Endangered Species Act, the Service specifically solicited comments on whether it should propose changing the listing status of polar bears to Appendix I. As discussed in the 2009 annual report the Commission believed that trade was not then a significant threat to polar bears and recommended against submitting an up-listing proposal for consideration at the Conference of Parties.

The Service nevertheless submitted a proposal to transfer the polar bear from Appendix II to Appendix I. The proposal noted that Article II of the Convention indicates that Appendix I shall include all species that are threatened with extinction and that are or may be affected by trade. The proposal also stated that the polar bear is threatened with extinction in accordance with the biological criteria set forth in CITES' Conference Resolution 9.24. In addition, the proposal noted that countries have been and are

engaged in active trading of polar bear parts, most of which are from wild bears. From 1992 through 2006, approximately 31,294 polar bear items (an average of 2,086 items annually) were exported or re-exported around the world, with 73 countries reporting polar bear imports. Finally, the proposal reviewed the predicted effects of receding sea ice habitat and concluded that the decrease in suitable habitat will exacerbate all other potential threats to the polar bear, "including, but not limited to, utilization and trade, disease or predation, contaminants, ecotourism, and shipping." In its proposal, the United States asserted that a precautionary approach, including listing the polar bear in Appendix I is necessary to ensure that commercial trade does not compound the threats posed to the species by loss of habitat.

Some CITES parties supported the U.S. proposal. They agreed that a precautionary approach to regulating international trade in polar bears was needed to help offset the threat to the species posed by climate disruption. Other countries, including three of the other range states (Canada, Norway, and Denmark on behalf of Greenland) opposed the proposed transfer. They argued that the species did not meet the biological criteria established under CITES to warrant an Appendix I listing. Opponents of the proposal also noted that there had been no recent increase in trade. They observed that what trade there was did not appear to be market-driven, but rather was based on an adaptive quota system to manage subsistence hunting. When put to a vote, the U.S. polar bear proposal failed to garner the required two-thirds majority, with 48 parties favoring the proposal, 62 against, and 11 abstaining.

At the end of 2011, the Fish and Wildlife Service was beginning to initiate its preparations for the 2013 Conference of Parties. It was unclear whether the Service would again propose a transfer of polar bears to Appendix I. However, recent information suggests that there has been an increase in polar bear trade since the 2010 CITES meeting and that market-demand seems to be fueling some of that increase. Prices for polar bear hides at auctions in Canada have more than doubled and prime pelts may sell for more than $10,000. This has translated into increased hunting pressure and moves to increase harvest levels for some populations. Thus, the situation seems to have changed since consideration of the 2010 proposal.

Arctic Ice-Associated Seals

Five species of pinnipeds occur commonly in U.S. Arctic waters, including the ringed seal (*Pusa hispida*), ribbon seal (*Histriophoca fasciata*), bearded seal (*Erignathus barbatus*), spotted seal (*Phoca largha*), and the walrus (*Odobenus rosmarus*). Alaska natives, scientists, managers, and conservationists often refer to the first four of these species as "ice seals" because, like the walrus, they associate with—and to varying degrees depend on—sea ice.

The National Marine Fisheries Service is the lead federal agency responsible for conservation of seals, and on matters pertaining to ice seals it cooperates with the Ice Seal Committee, which is composed of Alaska Natives who harvest seals for subsistence purposes. The Fish and Wildlife Service is the lead federal agency responsible for conservation of the walrus, and it cooperates primarily with the Alaska Eskimo Walrus Commission. The Services and these organizations work with Alaska Native communities, the Arctic Marine Mammal Program of the Alaska Department of Fish and Game, the U.S. Geological Survey, university researchers, and conservation organizations to conduct and support research and management activities related to ice seal species and walrus.

Until recently scientists generally have assumed that ice seal populations in U.S. waters were relatively unaffected by human activities other than in local areas (e.g., as a result of subsistence harvests by Alaska Natives). As is now evident, climate disruption, the associated rapid changes in sea-ice habitat and other environmental and ecological conditions, and the current and anticipated increases in human activities in the Arctic all pose serious risks to these species and to Arctic marine ecosystems (Laidre et al. 2008, Moore and Huntington 2008).

On the whole, however, support for research and assessment activities involving these species has been and continues to be inadequate, as is readily apparent in their stock assessment reports.[22] Undoubtedly, these species live in remote and inhospitable environments, and research and assessment are logistically difficult and expensive. Nonetheless, even with the growing awareness of climate disruption and the associated threats to Arctic marine ecosystems, the Services have yet to secure and provide resources needed to assess changes in the health and status of these species and to develop management strategies to protect and conserve them in the foreseeable future.

The record low sea-ice year in 2007 exacerbated concerns about the effects of climate disruption on these species. They use the ice for multiple purposes, including resting, reproduction, foraging, molting, and predator avoidance. In addition to changes in the physical environment, climate disruption will make possible increased human activities aimed at securing and using the Arctic's natural resources. Such activities include oil and gas development, commercial shipping, commercial fishing, military activities, tourism, and coastal development.

Collectively these activities may affect ice seals and walruses by disturbing them at sea and on land and ice, displacing them from important habitat, contaminating their feeding and resting areas, and injuring or killing them in fishing gear. For example, oil and gas development may disturb each of these species by generating noise, moving vessels and barges to support construction and drilling operations, constructing various types of infrastructure (e.g., platforms, pipelines), and developing coastal areas needed to support oil and gas operations. Oil and gas development also poses a risk of habitat contamination through discharge of drilling wastes and leaks or spills of oil, fuel, and other toxic chemicals. A large spill could have significant consequences for the walrus population if it occurred or spread at a time and in an area occupied by a large number of walruses, such as happens seasonally near the Bering Strait. Similarly, commercial shipping through the Arctic is increasing as sea ice recedes and brings with it a risk of collisions with cetacean species (e.g., bowhead whales). Although the risk of collision likely is not significant to pinniped species, it may increase disturbance from noise or the simple presence of vessels. Shipping also may lead to contamination of habitats, particularly from accidents that spill oil, fuels, or other toxic chemicals.

Prompted by listing petitions, the National Marine Fisheries Service and Fish and Wildlife Service conducted status reviews of all five species to determine if they warrant listing under the Endangered Species Act. The following sections describe the general biology of each species, the threats they face, recent information from the status reviews, and the status of listing decisions at the end of 2011.

Petitions to list ice associated pinnipeds under the Endangered Species Act

On 20 December 2007, 7 February 2008, and 28 May 2008, the Center for Biological Diversity submitted three petitions to list, respectively, the ribbon seal, the walrus, and bearded, ringed, and spotted seals under the Endangered Species Act. The petitions were based on threats from (1) loss of Arctic sea ice, (2) suspected high harvest levels in Russia, (3) oil and gas exploration and development, (4) rising contaminant levels in the Arctic, and (5) bycatch and competition for prey resources from commercial fisheries. Status reviews were completed for the ribbon seal (December 2008, spotted seal (October 2009) walrus (May 2010, bearded seals (December 2010), and ringed seal (December 2010). The results provide a comprehensive and valuable synthesis of current knowledge of these species, but also reveal significant deficiencies in the data needed to make informed management decisions. The details of the status review for each species, proposed listings, and progress are discussed below.

[22] http://www.nmfs.noaa.gov/pr/sars/region.htm

Ribbon seal (*Histriophoca fasciata*)

Figure IV-25. Adult male ribbon seal (Photo courtesy of Michael Cameron, NOAA)

The ribbon seal is one of the most recognizable of all pinnipeds because of the striking pelage pattern of adults (Figure IV-25). They are distributed primarily in the Okhotsk, Bering, East Siberian, and Chukchi Seas. They breed in two distinct areas, one in the Sea of Okhotsk and the other in the Bering Sea. They appear to use sea ice only during whelping, mating, and molting, all of which occur between March and June. During that period, they appear to prefer marine habitats with broken sea ice covering 60 to 80 percent of the surface or less than 15 cm thick so that they can break through to breathe. Mature females usually produce a single pup every year and nurse the pup for three or four weeks before weaning it. As the ice retreats into the Chukchi Sea, some ribbon seals follow it while others remain in the Bering Sea. Seals that do not follow the retreating ice do not haul out on land and recent tracking data indicate that they disperse throughout the Bering Sea–Aleutian Islands region and even into the North Pacific. Ribbon seals can live for up to 30 years, and they tend to be solitary throughout much of their lives. They feed on pelagic fish species such as walleye pollock but are thought to be relatively flexible in their foraging locations and habits.

Status and trends: Ribbon seals are difficult to count because they are widely dispersed. Burns (1981) estimated 240,000 ribbon seals worldwide in the mid-1970s, with 90,000 to 100,000 in the Bering Sea. Fedoseev (2002) estimated that the ribbon seals in the sea of Okhotsk increased from 200,000 (1968-1974) to 630,000 (1988-1990). The accuracy of these estimates is unknown. Ribbon seal numbers are thought to have varied markedly in the late 1900s because hunters harvested them and the numbers taken each year varied widely. In its status review of ribbon seals (Boveng et al. 2008), the National Marine Fisheries Service assumed a single global population of more than 200,000 animals. However, the review considered the accuracy of that estimate to be uncertain and cautioned that it should be considered an approximation based on limited information.

The effects of climate disruption and the need for listing: The National Marine Fisheries Service's status review (Boveng et al. 2008) concluded that the population is not currently in danger of extinction or likely to become so in the foreseeable future. However, the Service expects that ribbon seal abundance will decline gradually as the extent, quality, and duration of sea ice declines with climate disruption. It therefore added the ribbon seal to its Species of Concern list[23] and noted in its final rule that "there are no known regulatory mechanisms that effectively address global reductions in sea ice habitat at this time."

The Service's conclusion was based in part on the fact that the summer sea ice minimum generally occurs in September, whereas ribbon seals depend on the ice for reproduction and molting in the spring months. Sea ice will undoubtedly recede in the coming decades, but existing information is not sufficient to project the extent and quality of sea ice during the spring. The seals may be able to adapt by whelping, breeding, and molting earlier in the spring. In addition, changes in ice conditions almost certainly will act as a strong selective force on the ribbon seal population, favoring those seals that reproduce earlier in the season or are more capable of whelping and rearing their young in poor ice conditions. Finally, it is possible that the seals will use terrestrial haul out areas, although doing so in many areas will expose them to disturbance and predation.

Changes in the trophic structure of Arctic ecosystems also may affect ribbon seals and their ability to forage. However, they appear to be flexible foragers so they may be able to adapt to changing foraging

[23] http://www.nmfs.noaa.gov/pr/species/concern/#list

conditions. Given their tendency to disperse widely and lead relatively solitary lives, they also appear to be less vulnerable to human activities. Nonetheless, it remains to be seen whether and to what extent they are or will be affected by oil and gas development, commercial shipping and fishing, and other human activities, particularly when all these factors are considered together. At present, they do not appear to interact directly with commercial fishing operations. Whether they interact ecologically (i.e., compete) is not known.

The Center for Biological Diversity appealed the Service's finding for the ribbon seal and, on 13 December 2011 the Service published a notice (76 Fed. Reg. 77467) initiating a new status review. It did so, at least in part, based on (1) new information on ribbon seal movement patterns and diving behavior and (2) the Service's use of a modified threat-specific approach for analyzing the foreseeable future that the Service used in status reviews of the spotted, bearded, and ringed seals. The Service expected to complete its revised status review and provide its 12-month finding at the end of 2012.

Subsistence harvests: Russian commercial harvests removed as many as 20,000 ribbon seals per year in the 1950s, but current harvests are primarily for subsistence purposes. In Alaska, household surveys in the 1980s and 1990s indicate that Alaska Natives harvested about 200 ribbon seals per year (Allen and Angliss 2011). Kawerak, Inc., in conjunction with the Alaska Department of Fish and Game conducted household subsistence surveys in 2006–2007 and estimated that 12 Alaska Native communities harvested 91 ribbon seals in the Bering Strait area. Those estimates do not include seals that were struck but lost.

Stock assessment report: The most recent stock assessment report for the ribbon seal was completed in 2009.[24] It included a preliminary abundance estimate for the eastern and central Bering Sea of 49,000 seals, which is considered comparable with historical estimates and was used to infer that the stock has not experienced any major changes in recent decades. Given the uncertainty in the abundance estimate, the report did not include a minimum population estimate or an estimate of the potential biological removal level. The lack of such information undermines the Service's ability to determine the status of the ribbon seal, assess the risk to it from climate disruption, and develop measures to ensure its conservation.

Spotted seal (*Phoca largha*)

Spotted seals are distributed along the western north Pacific continental shelf from as far south as the Yellow Sea and Sea of Japan to the Sea of Okhotsk and into the Bering, Chukchi, and Beaufort Seas (Figure IV-26). Their distribution overlaps that of closely related harbor seals (*Phoca vitulina richardi*) and, like harbor seals, they prey on a range of species in coastal waters and periodically haul out on shore to rest. They have been reported breeding in eight distinct areas. However, the National Marine Fisheries Service treats them as three distinct population segments occurring in the Bering Sea; the Sea of Okhotsk; and the Yellow Sea and Peter the Great Bay in the Sea of Japan. Those divisions are based on small samples and preliminary analyses of genetic composition, potential geographic barriers, and significance of breeding groups.

Spotted seals are more gregarious than ribbon and bearded seals, and scientists have reported groups of more than 10,000 hauled out on the Kamchatka coast (Lowry and Burkanov 2008). In the late fall when sea ice begins to advance southward spotted seals leave their coastal haul out sites and begin to use the ice as a resting and foraging platform. They are common on small ice flows close to the ice edge, although tracking data indicate that some animals occur well within the pack ice, hundreds of kilometers from the ice edge.

Adult spotted seals are between 1.5 and 1.7 m long and weigh 70 to 130 kg with little difference between the sexes. They can live for up to 35 years. They breed in late winter, and adult females give birth in March. They wean their pups after 3 to 4 weeks and they mate shortly thereafter. Three of the eight known breeding areas are in the Bering Sea and the other five are in the sea of Okhotsk or Sea of

[24] http://www.nmfs.noaa.gov/pr/sars/species.htm

Japan. Spotted seals feed mostly on schooling fish (e.g. pollock, capelin, arctic cod, herring) and epi-benthic fish (e.g. flounder, halibut, sculpin), as well as crab and octopus. In turn, they are preyed upon by Pacific sleeper sharks, killer whales, golden eagles, Steller's sea eagles, ravens, gulls, polar and brown bears, wolves, arctic foxes, walruses, and Steller sea lions (Quakenbush 1988).

Status and trends: The National Marine Fisheries Service does not have what it considers a reliable estimate of current abundance for the spotted seal. Burns (1973) estimated a world population in the early 1970s of 335,000 to 450,000 spotted seals with 200,000 to 250,000 in the Bering and Chukchi Seas. Fedoseev (1971) estimated 168,000 spotted seals in the Okhotsk Sea in 1969 but later estimated a population ranging from 67,000 to 268,000 between the late 1960s and 1990s. In its status review for the spotted seal, the National Marine Fisheries Service estimated that the current Bering Sea and Sea of Okhotsk populations each exceed 100,000 seals. In contrast, the population in the Yellow Sea and Peter the Great Bay is much reduced. Counts of seals hauled out at this population's two breeding sites indicated 2,500 and 800 seals respectively (not corrected for seals in the water). This last population appears to be at far greater risk of extinction, and in recent decades China, South Korea, and Russia have sought to protect it by banning hunting, establishing a nature reserve, and giving the spotted seal special conservation status in portions of its habitat. To date, those measures have not proven sufficient to conserve and recover the population.

Effects of climate disruption and the need for listing: Compared with the ringed, bearded, and ribbon seals, spotted seals may be the least dependent on ice. For the most part, they appear to use the southern ice edge for pupping and foraging, but they also are capable of using coastal waters without ice, at least for a portion of their annual cycle. As with most Arctic marine mammals, the likely effects of climate disruption remain uncertain (see, for example, Burek et al. 2008). However, the Arctic Marine Mammal Program of the Alaska Department of Fish and Game has studied the diet, growth rates, body condition, age distribution, and productivity of spotted seals since 1962, and the results suggest that conditions in Alaska were least favorable for spotted seals in the 1970s. The explanation for this observation is not clear, but it may reflect decreased prey availability during that period (Quakenbush et al. 2009). Quakenbush et al. (2009) also reported that conditions appear to have improved since then. That finding supports the idea that climate disruption may not have affected spotted seals adversely in recent decades.

On 4 September 2008 the National Marine Fisheries Service released its 90-day finding regarding the petition to list spotted seals. The Service found that this petition contained substantial scientific and commercial information and that the status of the species warranted full review. On 20 October 2009 the Service released its proposed rule and 12-month finding regarding the spotted seal. It identified three distinct population segments of the spotted seal and indicated its intent to proceed with listing the southern distinct population segment as threatened under the Endangered Species Act.

On 21 December 2009 the Marine Mammal Commission wrote to the Service, supporting listing of the spotted seal southern distinct population segment and identifying the need to develop more suitable information to assess the status of the Okhotsk and Bering Sea distinct population segments. The Commission reiterated the need to devise and implement a research plan to address the major uncertainties and programmatic shortcomings revealed in the status review, including an adequate research budget. The Commission was particularly concerned about the inadequate basis for the Service's conclusions regarding the Okhotsk and Bering Sea distinct population segments, as revealed in the Service's statement that "in the absence of current information on the abundance levels or threats that may occur within each of the subdivisions… [we] have no basis to conclude that the spotted seal may be considered threatened or endangered." Finally, the Commission called for (1) strengthening efforts under the existing agreement between the United States and Russia on Cooperation in the Field of Protection of the Environment and Natural Resources and (2) consultation with the Department of State on ways to improve collaboration with Russian, Korean, Chinese, and Japanese researchers and managers responsible for the threatened southern distinct population segment.

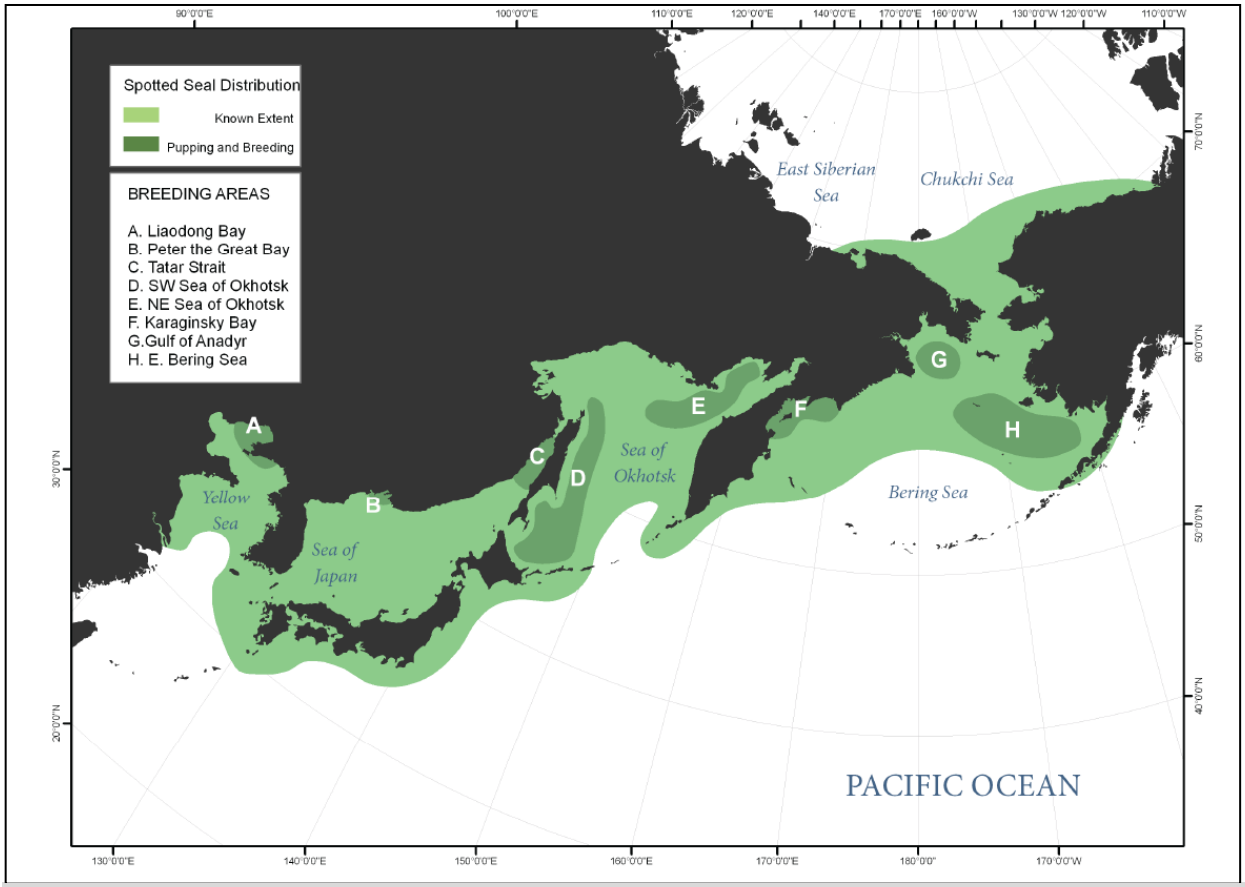

Figure IV-26. The global distribution of spotted seals (Boveng et al., 2009); seals at breeding and pupping areas comprise three distinct population segments: southern (A and B), Okhotsk (C, D and E) and Bering (F, G and H).

On 22 October 2010 the National Marine Fisheries Service issued a final rule to list the southern distinct population segment of the spotted seal (*Phoca largha*) as a threatened species under the Endangered Species Act. Because that population occurs outside the United States, the Service did not designate critical habitat.

Subsistence harvests: Historically the Russians harvested spotted seals for commercial purposes. In Alaska they are harvested for subsistence purposes, and household surveys indicate that Alaska Natives took about 5,300 spotted seals per year in the 1980s and 1990s (Allen and Angliss 2011). Kawerak, Inc., in conjunction with the Alaska Department of Fish and Game, conducted household subsistence surveys in 2006–2007 and estimated that the 12 surveyed communities harvested 2,509 spotted seals in the Bering Strait area. This estimate does not include animals struck and lost. Current harvest levels are unknown, and, absent better information, the effect of subsistence harvests of spotted seals cannot be described on a local basis or for the North Pacific population as a whole.

Stock assessment report: The National Marine Fisheries Service completed the most recent stock assessment report for the spotted seal in 2009.[25] The report did not include a minimum population estimate, description of population trends, or an estimate of the potential biological removal level. In the absence of reliable information about population abundance and demography, scientists are currently unable to describe with confidence the current status of spotted seals in Alaska waters, the current or pending effects of climate disruption on them, or the sustainability of current subsistence harvests.

[25] http://www.nmfs.noaa.gov/pr/sars/species.htm

Ringed seal (*Pusa hispida*)

The ringed seals are the smallest, most common, and most ice dependent of the Arctic seals. They comprise five subspecies. The most widely distributed (*P.h. hispida*) occurs throughout the Arctic Ocean. The others are *P.h. ochotensis* in the sea of Okhotsk and Sea of Japan, *P.h. botnica* in the Baltic Sea, and two freshwater sub species, *P.h. saimensis* in Lake Saimaa in eastern Finland and *P.h. ladogensis* in Lake Ladoga in Russia. Ringed seals can live for up to 30 years. Adults range from 115 to 136 cm in length and weigh 40 to 65 kg, males being slightly larger than females. Ringed seals play an especially important role in the Arctic where they prey on Arctic cod and a variety of invertebrates and are themselves the primary prey of polar bears. Polar bears prefer fat to a seal's other parts and ringed seal pups are approximately 50 percent fat by wet weight (Stirling 2002). In the eastern Beaufort Sea, up to 80 percent of polar bear diets may be young of the year ringed seals. If ringed seal productivity declines, the health of the polar bear population is likely to suffer accordingly (Stirling 2002).

Status and trends: Scientists have not surveyed Arctic ringed seals in all parts of their range, and current overall abundance is unknown. Educated guesses generally range from 1 to 4 million (e.g., Frost et al. 1988). The Arctic and Okhotsk subspecies are the most abundant. A century ago, the Baltic subspecies numbered between 190,000 and 220,000, but by the late 1970s it had been reduced to as few as 5,000 (Harding and Härkönen 1999). Although the decline likely resulted from commercial harvesting, reduced fertility from exposure to environmental contaminants also may have contributed (Harding and Härkönen 1999). The future status of this subspecies is unclear but likely will depend heavily on changes in ice habitat and contaminants. At the start of the 20th century the Ladoga subspecies numbered 20,000 animals, but by the 1970s it had been reduced to 10,000, in part by bounty hunting (Agafonova et al. 2007). Recent yearly bycatch of Ladoga ringed seals is as high as 10 to 16 percent (Verevkin et al. 2006), which is clearly unsustainable, as this population also is subject to high harvest levels. The IUCN lists the Ladoga ringed seal as endangered (Kovacs et al. 2012). The Saimaa ringed seal numbers in the low hundreds, is listed by the IUCN as critically endangered, and is vulnerable to climate disruption, inbreeding, fisheries bycatch, and high pup mortality. Conservation of this subspecies will require careful and steadfast management (Sipilä and Kokkonen 2008).

Effects of climate disruption and the need for listing: Ringed seals depend on ice and may decline greatly or even be extirpated throughout much of their range as a consequence of climate disruption. Arctic ringed seals in particular rarely haul out on land but rather use sea ice habitat to reproduce, molt, rest, feed, and avoid predators. In the winter and spring, they use shorefast ice (ice attached to land) or the pack ice, often in areas with greater than 90 percent ice coverage. In consolidated ice, which can be up to 2 or 3 m thick, they maintain breathing holes by abrading ice along the inside of the holes. Females excavate birth lairs in snowdrifts that form over their breathing holes to protect themselves from predators while they rest, give birth, and nurse their pups. Such lairs also protect the females and their pups from harsh Arctic weather.

Changes in sea ice habitat undoubtedly will have a significant impact on ringed seals. If poor ice conditions or precipitation causes a lair occupied by a pup to collapse before the pup is capable of fending for itself, it may die from exposure to inclement weather or predation. Late ice formation, early breakup of shorefast ice, and increased precipitation already have affected ringed seal denning behavior along the shorefast ice of the eastern Beaufort Sea, threatening female reproductive success and pup survival (Harwood et al. 2000). When summer sea ice has receded to the point that the Arctic is ice free, the seals will either have to remain at sea during the ice free period or haul out on land. Ringed seals in the Baltic Sea, Sea of Okhotsk and the freshwater lakes of Finland do haul out on land (Laidre et al. 2008), suggesting that seals of the Arctic subspecies may be able to do so as well, but they likely will be restricted to those areas that are not easily accessible to predators (e.g., polar bears, wolves, foxes, grizzly bears). Ringed seals also are vulnerable to climate disruption because the loss of ice likely will alter the nature and extent of primary production and the trophic food web that is based on that production.

Whether individual seals can adapt by changing their behavior or the ringed seal population can persist by virtue of strong selection on their natural history traits is not clear. The ability of scientists to

predict the effects of climate disruption on ringed seals will depend heavily on whether the necessary research is conducted to investigate their natural history, behavior, adaptability, and changes in abundance as the ice recedes. Undertaking such studies will require collaboration and cooperation by all interested and concerned stakeholders. Research by the Alaska Department of Fish and Game, federal agencies, and university researchers has been improved in recent years by participation of Alaska Natives, who have helped tag and track ringed and bearded seals and collected samples for genetic research and stock identification. Such research provides information on seasonal movements, diving behavior, and habitat use. Participation in research builds management capacity in Alaska Native villages through education and direct involvement in the research effort. It also provides cost-effective and practical support for researchers studying Arctic pinnipeds and promotes exchange between scientists and Alaska Natives, who contribute traditional ecological knowledge of the animals and their habitat.

On 4 September 2008 the National Marine Fisheries Service released its 90-day finding regarding the petition to list ringed seals. It found that the petition contained substantial scientific and commercial information and that the status of the species warranted full review. Based on the status review (Kelly et al. 2010), on 10 December 2010 the Service released its proposed rule and 12-month finding indicating its intent to list four of the five subspecies (the Arctic, Okhotsk, Baltic, and Ladoga subspecies) as threatened under the Endangered Species Act. The Lake Saimaa ringed seal was listed as endangered in 1993.

On 23 March 2011 the Marine Mammal Commission wrote to the Service to—

- support listing of the Okhotsk subspecies as threatened;
- recommend further evaluation of the population structure of the Arctic subspecies and, particularly, whether ringed seals in the Canadian Archipelago might comprise a separate subspecies;
- recommend further evaluation of the status of and threats to the Baltic and Lake Ladoga subspecies, and consider whether they should be listed as endangered;
- reiterated the need to devise and implement a research plan to address the major uncertainties and programmatic shortcomings revealed in the status review, including a realistic research budget;
- encourage the Service to strengthen collaborative efforts among range states to assess the status and trend of ringed seal populations throughout the species' range; and
- encourage the Service to collaborate with the Alaska Native community to monitor abundance and distribution of ringed seals, and use seals taken in the subsistence harvest to obtain data on demography, body condition, reproductive status, seasonal movements, patterns of dispersal of young, fidelity of adults to breeding areas, population structure, disease and parasites, contaminant loads, and other pertinent topics.

In March and April 2011, the Service held public hearings on the proposed listings in Anchorage, Barrow, and Nome, Alaska. At the end of 2011 the Service published a notice (76 Fed. Reg. 77466) delaying a final rule on listing ringed seals by six months to further consider the uncertainty in model predictions of future snow and ice conditions and the potential impacts on the seals.

Subsistence harvests: Historically ringed seals have been harvested for both commercial and subsistence purposes. Russian commercial harvests were as high as 72,000 animals a year between 1955 and 1965 (Kovacs et al. 2008). During the 1990s Canadian Inuit harvests were estimated in the tens of thousands (Reeves et al. 1998), and Greenland hunters harvested 70,000 annually (Teilman and Kapel 1998). Household surveys during the 1980s and 1990s indicate that Alaska Natives took between 9,000 and 10,000 ringed seals per year (Allen and Angliss 2011). Kawerak, Inc., in conjunction with the Alaska Department of Fish and Game, conducted household subsistence surveys in 2006 to 2007 and estimated that Alaska Natives from 12 communities in the Bering Strait region harvested 1,357 ringed seals per year. None of those numbers include animals struck and lost. In the Arctic, subsistence harvesting will have a far smaller influence on ringed seals than climate disruption. Nonetheless, ill-managed harvests may compound the effects of climate disruption, contributing to local reductions in seals or possibly even

extirpation in areas that might otherwise support some seals. Careful management of harvests will be essential to prevent such adverse effects.

Finally, climate disruption may affect ringed and other ice seals in a variety of ways. Chapter IX of this report describes an unusual mortality event involving the ringed seal, other ice seals, walrus, and potentially polar bears. The cause has not been determined but one hypothesis is that it was caused by a pathogen extending its range northward as the Arctic warms.

Stock assessment report: The National Marine Fisheries Service's most recent stock assessment report for the ringed seal was completed in 2009.[26] The report does not include a minimum population estimate, provides only a brief description of population trends, and does not include an estimate of the subspecies potential biological removal level. In the absence of such information, scientists are hampered in their ability to describe the current status of ringed seals in the Arctic, judge the sustainability of local subsistence harvests, or predict the future impact of climate disruption.

Bearded seal (*Erignathus barbatus*)

The bearded seal species (*Erignathus barbatus*) is comprised of an Atlantic subspecies (*E.b. barbatus*) and a Pacific subspecies (*E.b. nauticus*) that overlap in distribution in the Russian and Canadian Arctic. In the western North Pacific, bearded seals use continental shelf habitat as far south as Hokkaido, Japan, and in Alaska they inhabit the continental shelf of the Chukchi and Beaufort Seas. They generally prefer loose, mobile pack ice with 70 to 90 percent sea ice coverage, cracks in large floes, and shorefast ice. In the spring in Alaskan waters, they tend to be more abundant from 20 to 100 nmi offshore except in Kotzebue Sound, where they are found in relatively high concentrations in nearshore waters (Bengtson et al. 2000, Bengtson et al. 2005, Simpkins et al. 2003). They may maintain breathing holes but do so less frequently than ringed seals. Bearded seals in the Okhotsk, White, and Laptev Seas use terrestrial haul out sites when sea ice is not available. However, seals in the Bering and Chukchi Seas rarely do so. Instead, those seals not migrating north with the sea ice remain in open waters. Bearded seals can live for about 30 years. At full size, they measure up to 2.5 m in length, are the largest of the northern ice associated seals and weigh as much as 361 kg (female) to 390 kg (male) (Kelly 1988). A dense "beard" of whiskers on the top lip and a relatively small head distinguish the species from other seals. They are especially vocal underwater and, for millennia, Native hunters have used their sounds to locate them. They tend to be solitary, occurring in low densities throughout their range. They congregate in late winter in nearshore pack ice to give birth to pups on sea ice, nurse pups for about 15 days before weaning them, and then mate. They do not excavate lairs like ringed seals, and pups can swim within a few hours of birth. Females with pups stay in the water more than 90 percent of the time, presumably to avoid predation by polar bears. They molt between April and August. They prefer continental shelf areas and are primarily benthic foragers, preying on various invertebrates and demersal fishes. Killer whales, Greenland sharks, and occasionally walruses prey on bearded seals, and Arctic Natives harvest them for subsistence purposes.

Status and trends: Current population size and trends are not well known. Cameron et al. (2010) reviewed historic and current abundance and trends and estimate an abundance of 95,000 in the Sea of Okhotsk population and 155,000 for the Beringia population. They considered all regional estimates for the Atlantic subspecies to be unreliable except in Hudson Bay, the Canadian Archipelago, and western Baffin Bay, where they cited an estimate of 188,000 bearded seals.

Effects of climate disruption and the need for listing: Like the walrus, bearded seals use sea ice as a resting platform between benthic feeding bouts and depend on relatively shallow areas for feeding. An early northward retreat of spring sea ice over the Chukchi Sea continental shelf may reduce bearded seal foraging efficiency, thereby affecting their condition, health, and ability to survive and reproduce. As the ice edge moves out over deep water, bearded seals may be forced to haul out on land, where they are

[26] http://www.nmfs.noaa.gov/pr/sars/species.htm

more vulnerable to disturbance and predation. As generalist feeders, they may adapt more readily than other ice seals to changes in ecosystem food webs.

As with all Arctic species, determining the effects of climate disruption on bearded seals will require baseline information for comparative studies. In recent years, Alaska Natives have joined scientists from the Alaska Department of Fish and Game, University of Alaska, and National Marine Mammal Laboratory to study bearded seal life history traits. Most recently, this collaboration has focused on methods to capture live adult seals and fit them with satellite-linked data recorders. The results from such studies will be useful in describing bearded seal distribution and movement patterns, diving and foraging behavior, key habitats, and other traits that can be used to develop correction factors for surveys of abundance.

On 4 September 2008 the National Marine Fisheries Service released its 90-day finding regarding the petition to list bearded seals. The Service found that this petition contained substantial scientific and commercial information and that the status of the species warranted full review. On 10 December 2010 the Service released its proposed rule and 12-month finding regarding the bearded seal. In the status review (Cameron et al. 2010) the Service indicated its intent to list as threatened both the Sea of Okhotsk and Beringia bearded seal populations as distinct population segments of the Pacific sub-species. The Service concluded that listing of the Atlantic subspecies is not warranted at this time.

On 23 March 2011 the Marine Mammal Commission wrote to the Service, supporting listing of the Okhotsk and Beringia population segments as threatened and recommending further monitoring and periodic re-evaluation of the status of the Atlantic subspecies. Additionally, the Commission reiterated the need to devise and implement a research plan to address the major uncertainties and programmatic shortcomings revealed in the status review, including an adequate research budget. The Commission recommended that the Service facilitate research and management cooperation among the five nations with jurisdiction over parts of the species' range. The Commission also recommended that the Service continue to collaborate with the Alaska Native community to monitor abundance and distribution of bearded seals, and use seals taken in the subsistence harvest to obtain data on demography, body condition, reproductive status, seasonal movements, patterns of dispersal of young, fidelity of adults to breeding areas, population structure, disease and parasites, contaminant loads, and other pertinent topics.

In March and April 2011, the Service held public hearings on the proposed listings in Anchorage, Barrow, and Nome, Alaska. At the end of 2011 the Service published a notice (76 Fed. Reg. 77465) delaying a final rule on listing bearded seals by six months to further consider the uncertainty in model predictions of future snow and ice conditions and the potential impacts on the seals.

Subsistence harvests: The bearded seal is one of the most important subsistence resources for Alaska Native communities along Alaska's western and northern coasts. The Alaska Department of Fish and Game (2000) estimated that Alaska Natives harvested between 6,500 and 7,000 bearded seals annually prior to 2000. Current statewide harvest levels are not known, but household subsistence surveys conducted in 2006 to 2007 by Kawerak, Inc., and the Alaska Department of Fish and Game indicate that 2,476 bearded seals were harvested by 12 communities in the Bering Strait area. Some unknown number of bearded seals are struck and lost each year, and Reijnders et al. (1993) estimated that the loss rate for bearded seals in Greenland may be as high as 50 percent. If struck and lost rates are similar in Alaska, then a large and potentially significant number of bearded seals that are killed each year are not accounted for in subsistence harvest management. Here again, human activities that affect this Arctic marine mammal cannot be managed effectively without better information.

Stock assessment report: The National Marine Fisheries Service prepares a stock assessment report only for the Pacific subspecies because, with rare exceptions, bearded seals occur in U.S. waters only in the North Pacific, Bering Sea, and Alaskan Arctic. The service completed its most recent stock assessment report for the Pacific bearded seal stock in 2009.[27] It did not include a minimum population estimate, description of population trends, or an estimate of the potential biological removal level. The lack of basic information about the stock precludes a meaningful assessment of its status and its

[27] http://www.nmfs.noaa.gov/pr/sars/species.htm

vulnerability to climate disruption, subsistence harvests, and the other human activities projected to increase in the Arctic in the foreseeable future.

Pacific Walrus (*Odobenus rosmarus divergens*)

Scientists divide the walrus species (*Odobenus rosmarus*) into two subspecies: the Atlantic walrus (*O. r. rosmarus*) and the Pacific walrus (*O. r. divergens*). The Atlantic subspecies is considerably less abundant than the Pacific subspecies and does not occur in U.S. waters (Table IV-6). Although some marine mammal and taxonomic literature recognizes the population of walruses centered in the Laptev Sea as a separate subspecies (*O.r. laptevi*), the Society for Marine Mammalogy does not.[28] Pacific walruses occur over the continental shelf of the Bering, East Siberian, Chukchi, western Beaufort, and now Laptev Seas and are easily recognized by their prominent tusks and large size—an average male weighs about 1,200 kg (2,645 lbs). Walruses can live for up to 40 years. Mature females produce a calf every two or three years, breeding in late winter and usually giving birth about 15 to 17 months later. Walruses feed in shallow waters, usually less than 80 m deep, and consume mostly clams and mussels and other benthic invertebrates such as snails and marine worms. They use their snouts to root in soft sediments, feeling for prey with their sensitive vibrissae. They use their mouths to create suction and remove animals from their shells. They also are known to eat seals, although the frequency with which they do so is not clear, and seals are not considered common prey. Walruses collectively consume an estimated 3 million metric tons of prey per year, making them an important ecological component of the Bering and Chukchi Sea ecosystems (Ray et al. 2006). Polar bears and killer whales are the only nonhuman predators on walruses, although adult walruses are formidable prey.

In winter, most Pacific walruses concentrate in polynyas and open leads southwest of St. Lawrence Island in Bristol Bay and the Gulf of Anadyr (Russian Federation). In summer, most females, juveniles, and calves follow the retreating pack ice into the Chukchi Sea, staying with the ice edge throughout the summer as it recedes and passes over the continental shelf. The retreating ice edge provides a resting platform that passes over feeding grounds, facilitating access to prey while reducing the likelihood of depleting any single feeding site. Once the ice edge has retreated beyond the continental shelf the walruses begin to use coastal haulouts until the ice reforms in winter. Other females and calves use coastal haulouts, particularly in the Gulf of Anadyr. Most adult males remain year-round in the Bering Sea, Gulf of Anadyr, and Karaginski Bay. During the summer, they rest on and feed from terrestrial haulout sites. The most common haulout sites in Alaska are Round Island, Cape Pierce, Cape Newenham, Hagemeister Island, and Cape Seniavin, all in Bristol Bay. In addition, walruses sometimes haul out on Punuk Island (near St. Lawrence Island), in the fall. Other walruses remain at terrestrial haulout sites

Table IV-6. Current abundance and trend estimates for Pacific, Atlantic, and Laptev Sea walrus populations.

Region	Abundance	Year	Trends
Bering-Chukchi Seas[a]	129,000[*]	2006	Unknown
Atlantic[b]	18,000–20,000	2005–2008	Mixed
Laptev Sea[c]	4,000–5,000	1982	Unknown

[a] Speckman et al. (2011)
[b] COSEWIC (2006), Lydersen et al. (2008), Witting and Born (2005)
[c] Fay (1982)
[*]Not corrected for the full range of Pacific walruses (see text)

[28] http://www.marinemammalscience.org/index.php?option=com_content&view=article&id=645&Itemid=340

along the north coast of the Chukotka Peninsula and on Wrangel Island in the Chukchi Sea. Haul out patterns are changing with climate disruption and in 2008, 2010, and 2011 large numbers (20,000 plus) of walruses used the barrier island north of Point Lay, Alaska as a haulout site. During fall, walruses move south with the advancing ice, sometimes aggregating in herds of thousands as they pass back through the Bering Strait and northern Bering Sea.

Status and trends

The abundance of Pacific walruses before European contact is not known but may have been on the order of 200,000 to 300,000. Commercial hunting began in earnest in the mid-1800s and caused wide fluctuations in walrus abundance over the next century (Fay 1982). By the late 1800s declines in walrus numbers were so severe that they contributed to widespread famine and starvation among Native populations (Allen 1895). The walrus population must have recovered to some extent by the early 1900s, but commercial hunting intensified again in the 1930s, peaking in 1937-1938 when Soviet hunters alone took more than 8,000 Pacific walruses (Krylov 1968). By the 1950s the Pacific walrus population had been reduced to 50,000 to 100,000 animals (Fay 1982). In the 1960s the Soviet Union and the state of Alaska independently established conservation measures to protect the Pacific walrus and the population rebounded. From 1975 to 1990 U.S. and Russian scientists conducted joint range-wide aerial surveys every five years to estimate abundance of the Pacific walrus population. The surveys produced population estimates with such wide confidence intervals that they were considered of little value for assessing population trends. The 1990 survey resulted in an estimate of 201,039 animals (Gilbert et al. 1992). Scientists did not survey the population between 1990 and 2006, partly because surveys are expensive and difficult to coordinate. In 2006 the Fish and Wildlife Service, U.S. Geological Survey, and the Russian institutes Giprorybflot and Chukotka TINRO surveyed the population again using newly developed aerial census techniques. The Fish and Wildlife Service reported the population estimate for the surveyed area as 129,000 with a very wide 95 percent confidence interval of 55,000 to 507,000 individuals. These figures were not corrected to account for the full geographic range of walruses including two areas where walruses normally occur, and therefore the estimates are biased low. Because of the wide confidence interval and the bias in the estimate owing to the incomplete geographic coverage, the 2006 estimate is considered unreliable and of little value for estimating population abundance and trends.

The effects of climate disruption and the need for listing

Climate disruption and the associated ongoing and projected reduction in sea ice habitat pose a serious threat to walruses. These animals are able to swim and feed for only a limited number of days and require resting habitat, either suitably thick sea ice or land near feeding areas (Figure IV-27).

The proximity of such habitat to adequate food sources determines whether walruses are able to consume enough prey to meet their energy needs. Since 2007 the summer sea ice has declined compared with previous years and large numbers of walruses have come ashore in 2007, 2009, 2010, and 2011 in Alaska and northern Chukotka following the northward retreat of the sea ice. Such use of land haulouts was not common in Alaska in recent decades and is consistent with the concern that the walruses will deplete the local food supply because they are limited to feeding around the haulout area. In addition, when hauled out on land they are more vulnerable to disturbance and, if disturbed, more prone to injury from trampling. Calves and yearlings are particularly vulnerable to injury by large adults moving to and from the water. The risk of injury is exacerbated if the animals are startled and stampede toward the water.

In 2007 Chukotka Natives and biologists observing haulout areas reported high levels of mortality, particularly of calves, and suspected that the cause was trampling. Seasonal sea ice was not as diminished in 2008 and relatively few walruses hauled out on land in northern Alaska. In 2008 the Eskimo Walrus Commission passed a resolution to limit disturbance of walruses at land haulouts. In 2009 walruses again hauled out in large numbers along the coasts of northern Alaska and Russia. At Icy Cape, Alaska, the

animals apparently stampeded, killing at least 131 calves. The cause of the stampede is not known, but the Fish and Wildlife Service and the Eskimo Walrus Commission continue to work with communities in Russia and Alaska to prevent such occurrences by avoiding activities that might disturb walruses hauled out on land. These efforts appear to be working as stampede-related mortality was reduced in 2010 and 2011.

Because of the risks posed to walruses by climate disruption, in February 2008 the Center for Biological Diversity petitioned the Fish and Wildlife Service to list the walrus under the Endangered Species Act. In December 2008 the Center sued the Service and the Secretary of the Interior for failing to respond to its petition. On 10 September 2009 the Fish and Wildlife Service acknowledged that there was sufficient information in the petition to indicate that listing the Pacific walrus under the Endangered Species Act may be warranted and initiated a status review. The Marine Mammal Commission reviewed the petition and, in January 2011, recommended that the Service propose to list the Pacific walrus as threatened and give the public the opportunity to comment. The Commission based its recommendation on concerns regarding four of the five listing factors set forth in the Endangered Species Act, including the—

- present or threatened destruction, modification, or curtailment of the species' habitat or range;
- potential overutilization for commercial, subsistence, recreational, scientific or educational purposes;
- secondary threats such as diseases, parasites, and predation; and
- inadequacy of existing regulatory mechanisms.

On 10 February 2011 the Fish and Wildlife Service published a 12-month finding on the petition to list the Pacific walrus (76 Fed. Reg. 7634). It found that listing was warranted but precluded at that time by higher-priority actions and it added the Pacific walrus to the list of candidate species. The Service stated that it would develop a proposed rule to list the Pacific walrus as its priorities allowed. On 12 July 2011, and as part of a multi-district litigation settlement agreement, the Service agreed to either submit a Proposed Rule or a not-warranted finding to the *Federal Register* for the Pacific walrus no later than Fiscal Year 2017.

Subsistence harvests

For several thousand years, Native communities in Alaska and Russia have relied on the Pacific walrus as a vital nutritional, cultural, and economic resource. Natives have depended, and continue to depend, on meat, ivory, and other walrus parts for food and other subsistence needs, including the production of handicrafts. In modern times, ivory carvings have become a particularly important source of income in some villages.

The Marine Mammal Protection Act of 1972 included exemptions to its moratorium on taking to allow Alaska Natives to continue harvesting marine mammals for subsistence purposes, or for making authentic handicrafts and clothing, provided that the take is not wasteful. In the 1960s and 1970s the Alaska Department of Fish and Game monitored the subsistence harvest. In 1980 the Fish and Wildlife Service assumed responsibility for harvest management. Currently, the Service and the Eskimo Walrus Commission work together with Native communities to monitor the subsistence harvest, collect biological samples from harvested animals, and conduct a statutorily required ivory tagging program.

In the 1960s and 1970s authorities monitored the harvest in seven villages. At present they monitor only the spring hunt in two villages—Gambell and Savoonga on St. Lawrence Island—where as much as 90 percent of the reported statewide harvest occurs.

In 1988, and as a result of amendments to the MMPA, the Fish and Wildlife Service initiated a marking, tagging, and reporting program for the Pacific walrus, as well as northern sea otter and polar bear, to help monitor subsistence harvest and prevent illegal trade in ivory or other marine mammal products. As a part of this program, it is required that all walruses harvested be reported and the tagging

Figure IV-27. A walrus herd resting on and swimming around a chunk of pack ice during the spring breakup in the Chukchi Sea, off the National Petroleum Reserves, Alaska (Photo courtesy of Steven Kazlowski, Minden Pictures)

of tusks occur within 30 days of the harvest. Although the Service intends for the program to be comprehensive, compliance is incomplete in some villages.

As part of the Walrus Harvest Monitoring Project, Fish and Wildlife Service employs or contracts with residents of Gambell and Savoonga to record the number of walruses taken and collect biological samples during a four week period each spring. This information is used to estimate the harvest and to gather information on the walruses harvested (e.g., reproductive rates). Because the harvesting of some walruses is not reported through the tagging program, above, and calves do not have tusks to tag, this second program also serves the purposes of counting harvested calves as well as developing tagging compliance correction factors that are applied to data from the tagging program to estimate the total harvest in the United States.

Hunters also shoot and then fail to recover an additional number of walruses. Fay et al. (1994) used data collected between 1952 and 1972 to estimate that 42 percent of shot walruses were not recovered. The Fish and Wildlife Service still uses that correction factor for struck and lost animals, although its accuracy is uncertain, particularly given changes to hunting practices and equipment. The total estimated annual harvests by Russians and Americans from 2003 to 2011 are listed in Table IV-7. The numbers taken in recent years are about half of those taken in the mid-1980s. The change could reflect a shift in harvesting practices, a purposeful reduction in harvests, a decline in the walrus population, changes in weather, ice and migration patterns that affect the harvest, or some combination of these factors.

The fishery department in Russia's Agricultural Ministry manages walrus harvests in Russia. Since 1992 Russian managers have allowed only Native people to harvest walruses. In 1998 Russia suspended its walrus harvest monitoring and research programs because of economic constraints. In 1999 the

Table IV-7. Combined U.S. and Russian harvest of Pacific walruses, 2003 to 2011. (Source: Fish and Wildlife Service)

Year	Number harvested U.S.	Standard error of number harvested U.S.	Number harvested Russia	Total number struck and lost	Estimated total number removed	Standard error of estimated total number removed
2003	2,162	128	1,425	2,598	6,185	221
2004	1,549	44	1,118	1,931	4,598	76
2005	1,399	8	1,436	2,053	4,889	14
2006	1,286	91	1,047	1,689	4,022	157
2007	2,376	74	1,173	2,570	6,119	127
2008	1,442	107	778	1,608	3,827	185
2009	2,123	379	1,110	2,341	5,574	654
2010	1,682	178	1,053	1,981	4,716	308
2011	1,104	112	NA	799	1,903	194

Eskimo Walrus Commission and the Fish and Wildlife Service secured funding from various sources, including the North Slope Borough and the National Park Service, to train and support Native villagers from Russia's Chukotka region in the collection of walrus harvest data. That support continued through 2005. In 2008 the National Park Service's Beringia Program provided further funding under a cooperative agreement with the Eskimo Walrus Commission, and that funding was to be used to collect Russian harvest data through 2009.

The management of the walrus harvest has been improved by co-management efforts involving the Eskimo Walrus Commission and the Fish and Wildlife Service. In 2002 the Marine Mammal Commission recommended initiation of a long-term tissue sampling effort to provide information on age-specific reproduction, prey selection, contaminant levels, and other important parameters to facilitate evaluation of the population' s status and trends. Accordingly, the Service and the Eskimo Walrus Commission have been collecting biological samples annually as funding allows. Much of this sample collection is driven by the goals of a variety of research projects. In addition, in 2007 the Alaska Native villages of Gambell and Savoonga decided to renew their local hunting ordinances, which dated back to the 1920s. They developed new ordinances, which were put into place in 2010, that limit the number of walruses that can be harvested on a hunting trip to 4 or 5 depending on the sex and age composition of the harvested animals. In 2011, the Native Village of Gambell was awarded a Tribal Wildlife Grant from the Service to administer the program and enforce the ordinances in both villages. The two communities have been working to ensure consistency with each other and with the Marine Mammal Protection Act.

Stock assessment report

The Fish and Wildlife Service completed its most recent stock assessment report for the Pacific walrus on 30 December 2009.[29] The report estimates the potential biological removal level at 2,580 walruses based on a minimum population estimate of 129,000. For the most recent five years of complete U.S. and Russian harvest data, the mean annual harvest estimate (corrected for hunting loss) is about 4,850 (Table IV-7). A large part of the discrepancy between these two figures (2,580 and 4,850) may be caused by the negative bias in the abundance estimate, which did not account for the full range of Pacific walruses. Nevertheless, the difference between the estimated potential biological removal level and the reported harvest level is substantial and sufficient to raise concerns about the population's ability to

[29] alaska.fws.gov/fisheries/mmm/stock/final_pacific_walrus_sar.pdf

sustain current harvests. Those concerns add emphasis to the need for better population assessment and are compounded by concerns about the effects of climate disruption on walrus habitat, poor calf survival, and an unusual mortality event at the end of 2011.

Literature cited

Aars, J., N.J. Lunn, and A.E. Derocher. eds. 2006. Polar bears: proceedings of the 14th working meeting of the IUCN/SSC Polar Bear Specialist Group, 20-24 June, Seattle, Washington, USA. IUCN, Gland, Switzerland, 189 pages.

Agafonova, E.V., M.V. Verevkin, R.A. Sagitov, T. Sipilä, M.V. Sokolovskay, and V.U. Shahnazarova. 2007. The ringed seal in Lake Ladoga and the Valaam Archipelago. Baltic Fund for Nature of Saint-Petersburg Naturalist Society, St. Petersburg State University and Metsähallitus, Natural Heritage Services, Vammalan Kirjapaino OY.

Alaska Department of Fish and Game. 2000. Community Profile Database 3.04 for Access 97. Division of Subsistence, Anchorage, Alaska.

Alaska v. *Lubchenco*, 825 F. Supp. 2d 209 – Dist. Court, Dist. of Columbia 2011.

Allen, B.M., and R.P. Angliss. 2011. Alaska marine mammal stock assessments, 2010. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-223, 301 pages.

Allen, J.A. 1895. A synopsis of the pinnipeds, or seals and walruses, in relation to their commercial history and products. Pages 367–391 *in* Fur Seal Arbitration. Vol. 1, 53rd Congress, 2nd Session, Senate Executive Document 177. Government Printing Office, Washington, D.C.

Alter, S.E., E. Rynes, S.R. Palumbi. 2007. DNA evidence for historic population size and past ecosystem impacts of gray whales. Proceedings of the National Academy of Science 104:15162–15167.

Amstrup, S.C. et al. 2006. Recent observations of intraspecific predation and cannibalism among polar bears in the southern Beaufort Sea. Polar Biology 29:997-1002.

Ayres, K.L., R.K. Booth, J.A. Hempelmann, K.L. Koski, C.K. Emmons, R.W. Baird, K. Balcomb-Bartok, M.B. Hanson, M.J. Ford, and S.K. Wasser. 2012. Distinguishing the impacts of inadequate prey and vessel traffic on an endangered killer whale (*Orcinus orca*) population. PLoS One 7:e36842.

Baird, R.W. 2001. Status of killer whales, *Orcinus orca*, in Canada**.** Canadian Field-Naturalist 115:676-701.

Baird, R.W., A.M. Gorgone, D.J. McSweeney, D.L. Webster, D.R. Salden, M.H. Deakos, A.D. Ligon, G.S. Schorr, J. Barlow, and S.D. Mahaffy. 2008a. False killer whales (*Pseudorca crassidens*) around the main Hawaiian Islands: Long-term site fidelity, inter-island movements, and association patterns. Marine Mammal Science 24:591-612.

Baird, R.W., G.S. Schorr, D.L. Webster, D.J. McSweeney, A.M. Gorgone, and S.J. Chivers. 2008b. A survey to assess overlap of insular and offshore false killer whales (*Pseudorca crassidens*) off the island of Hawai‘i. Report prepared under Order No. AB133F07SE4484 for the Pacific Islands Fisheries Science Center, National Marine Fisheries Service, Honolulu, HI. Available at http://www.cascadiaresearch.org/robin/hawaii.htm.

Baird, R.W. 2009. A review of false killer whales in Hawaiian waters: Biology, status, and risk factors. Report prepared for the U.S. Marine Mammal Commission under Order No. E40475499, Bethesda, MD, 40 pages.

Baird, R.W., G.S. Schorr, D.L. Webster, D.J. McSweeney, M.B. Hanson and R.D. Andrews. 2010. Movements and habitat use of satellite-tagged false killer whales around the main Hawaiian Islands. Endangered Species Research 10:107-121.

Baird, R.W., E.M. Oleson, J. Barlow, A.D. Ligon, A.M. Gorgone, and S.D. Mahaffy. 2011. Photo-identification and satellite tagging of false killer whales during HICEAS II: evidence of an island-associated population in the Papahānaumokuākea Marine National Monument. Document PSRG-2011-16 presented to the Pacific Scientific Review Group, Seattle, November 2011.

Baker, J.D., A.L. Harting, T.A. Worth, and T.C. Johanos. 2011. Dramatic shifts in Hawaiian monk seal distribution predicted from divergent regional trends. Marine Mammal Science 27(1):78–93.

Barlas, M.E., C.J. Deutsch, M. de Wit, and L.I. Ward-Geiger (editors). 2011. Florida manatee cold-related unusual mortality event, January-April 2010. Preliminary report to the U.S. Fish and Wildlife Service (grant 40181AG037). Fish and Wildlife Research Institute. Florida Fish and Wildlife Conservation Commission, St. Petersburg, FL, 136 pages.

Bengtson, J.L., P.L. Boveng, L.M. Hiruki-Raring, K.L. Laidre, C. Pungowiyi, and M.A. Simpkins. 2000. Abundance and distribution of ringed seals (*Phoca hispida*) in the coastal Chukchi Sea. Pages 149–160 *in* A.L.

Lopez and D.P. DeMaster (eds.), Marine Mammal Protection Act and Endangered Species Act Implementation Program 1999.

Bengtson, J.L., L.M. Hiruki-Raring, M.A. Simpkins, and P.L. Boveng. 2005. Ringed and bearded seal densities in the eastern Chukchi Sea, 1999–2000. Polar Biology 28:833–845.

Bossart, G.D., R.A. Meissner, S.A. Rommel, G. Ghim, and A. Bennett Jenson. 2002. Pathological features of the Florida manatee cold stress syndrome. Aquatic Mammals 29:9-17.

Boveng, P.L., J.L. Bengtson, T.W. Buckley, M.F. Cameron, S.P. Dahle, B.P. Kelly, B.A. Megrey, J.E. Overland, and N.J. Williamson. 2009. Status review of the spotted seal (*Phoca largha*). U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-200, 153 pages.

Boveng, P.L., J.L. Bengtson, T.W. Buckley, M.F. Cameron, S.P. Dahle, B.A. Megrey, J.E. Overland, and N.J. Williamson. 2008. Status review of the ribbon seal (*Histriophoca fasciata*). U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-191, 115 pages.

Brown, S.G. 1986. Twentieth-century records of right whales (*Eubalaena glacialis*) in the northeast Atlantic Ocean. Pages 121–127 *in* R.L. Brownell, Jr., P.B. Best, and J.H. Prescott (eds.), Right Whales: Past and Present Status. Special Issue 10. Reports of the International Whaling Commission, Cambridge, U.K., 289 pages.

Burek, K.A., F.M.D. Gulland, and T.M. O'Hara. 2008. Effects of climate change on Arctic marine mammal health. Ecological Applications 18(2):S126–134.

Burn, D.M., and A.M. Doroff. 2005. Decline in sea otter (*Enhydra lutris*) populations along the Alaska Peninsula, 1986–2001. Fishery Bulletin 103:270–279.

Burnie, P. 1985. International Regulation of Whaling: From Conservation of Whaling to Conservation of Whales and Regulation of Whale Watching. Vol. I of III, Chapter III, pages 105–142. Regulation of whaling during the League of Nations Period: 1919–1946. Oceana Publications, Inc., New York, 554 pages.

Burns, J.J. 1981. Ribbon seal. Pages 89–109 *in* S.H. Ridgway and R.J. Harrison (eds.), Handbook of Marine Mammals. Vol. 2: Seals. Academic Press, London, UK.

Burns, J.J. 1973. Marine mammal report. Alaska Department of Fish and Game, Pittman-Robertson Project Report, W-17-3, W-17-4, and W-17-5.

Cameron, M.F., J.L. Bengtson, P.L. Boveng, J.K. Jansen, B.P. Kelly, S.P. Dahle, E.A. Logerwell, J.E. Overland, C.L. Sabine, G.T. Waring, and J.M. Wilder. 2010. Status review of the bearded seal (*Erignathus barbatus*). U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-211, 246 pages.

Carretta, J.V., K.A. Forney, E. Oleson, K. Martien, M.M. Muto, M.S. Lowry, J. Barlow, J. Baker, B. Hanson, D. Lynch, L. Carswell, R.L. Brownell Jr., J. Robbins, D.K. Mattila, K. Ralls, and M.C. Hill. 2010. U.S. Pacific marine mammal stock assessments: 2009. NOAA-TM-NMFS-SWFSC-453, Southwest Fisheries Science Center, National Marine Fisheries Service, La Jolla, CA, 352 pages.

Chivers, S.J., R.W. Baird, D.J. McSweeney, D.L. Webster, N.M. Hedrick, and J.C. Salinas. 2007. Genetic variation and evidence for population structure in eastern North Pacific false killer whales (*Pseudorca crassidens*). Canadian Journal of Zoology 85:783–794.

Chivers, S.J., K.A. Forney, and D. Johnston. 2008. Rationale for the 2008 revision to Hawaiian stock boundaries for false killer whales, *Pseudorca crassidens*. Southwest Fisheries Science Center Administrative Report LJ-08-04, National Marine Fisheries Service, La Jolla, CA, 5 pages.

Chivers, S.J., R.W. Baird, K.M. Martien, B.L. Taylor, E. Archer, A.M. Gorgone, B.L. Hancock, N.M. Hedrick, D. Mattila, D.J. McSweeney, E.M. Oleson, C.L. Palmer, V. Pease, K.M. Robertson, J. Robbins, J.C. Salinas, G.S. Schorr, M. Schultz, J.L. Theileking, and D.L. Webster. 2010. Evidence of genetic differentiation for Hawai'i insular false killer whales (*Pseudorca crassidens*). NOAA Technical Memorandum, National Marine Fisheries Service, Southwest Fisheries Science Center, NOAA-TM-NMFS-SWFSC-458, 44 pages.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2006. COSEWIC assessment and status report on the Atlantic walrus *Odobenus rosmarus rosmarus* in Canada. Canadian Wildlife Service, Environment Canada, Ottawa, Ontario.

Doroshenko, N.V. 2000. Soviet whaling for blue, gray, bowhead, and right whales in the North Pacific Ocean, 1961–1979. Pages 96–103 i*n* A.V. Yablokov and V.A. Zemsky, Soviet Whaling Data (1949–1979). Pacific Research and Fisheries Centre (TINRO Centre). Vladivostok, Russia. Center for Russian Environmental Policy. Moscow, Russia.

Durner, G.M. et al. 2009. Predicting 21st-century polar bear habitat distribution from global climate models. Ecological Monographs 79:25-58.

Estes, J.A. 1990. Growth and equilibrium in sea otter populations. Journal of Animal Ecology 59:385–401.

Estes, J.A., M.T. Tinker, T.M. Williams, and D.F. Doak. 1998. Killer whale predation linking oceanic and nearshore ecosystems. Science 282:473–476.

Estes, J.A., M.T. Tinker, A.M. Doroff, and D.M. Burn. 2005. Continuing sea otter population declines in the Aleutian archipelago. Marine Mammal Science 21:169–172.

Fay, F.H. 1982. Ecology and biology of the Pacific walrus, *Odobenus rosmarus divergens* Illiger. North American Fauna Number 74. U.S. Department of the Interior, Fish and Wildlife Service.

Fay, F.H., J.J. Burns, S.W. Stoker, and J.S. Grundy. 1994. The struck-and-lost factor in Alaskan walrus harvests, 1952–1972. Arctic 47:368–373.

Fedoseev, G.A. 2002. Ribbon seal *Histriophoca fasciata*. Pages 39–45 *in* W.F. Perrin, B. Würsig, and J.G.M. Thewissen (eds.), Encyclopedia of Marine Mammals, Academic Press, San Diego, California.

Fedoseev, G.A. 1971. The distribution and numbers of seals on whelping and moulting patches in the Sea of Okhotsk. Pages 135–158 *in* K.K. Chapskii and E.S. Mil'chenko (eds.), Research on Marine Mammals. Translated from Russian by Canadian Fisheries Marine Service, 1974, Translation Series 3185.

Fisheries and Oceans Canada. 2008. Recovery Strategy for the Northern and Southern Resident Killer Whales (*Orcinus orca*) in Canada. Species at Risk Act Recovery Strategy Series, Fisheries and Oceans Canada, Ottawa, ix+81 pages.

Frost, K.J., L.F. Lowry, J.R. Gilbert, and J.J. Burns. 1988. Ringed seal monitoring: Relationships of distribution and abundance to habitat attributes and industrial activities. Final Report. Contract Number 84-ABC-00210 submitted to U.S. Department of the Interior, Minerals Management Service, Anchorage, Alaska, 101 pages.

Gilbert, J.R., G.A. Fedoseev, D. Seagars, E. Razlivalov, and A. Lachugin. 1992. Aerial census of Pacific walrus, 1990. USFWS R7 MMM Technical Report 92-1, Fish and Wildlife Service, Marine Mammals Management, Anchorage, Alaska, 33 pages.

Gobush, K.S., J.D. Baker, and F.M.D. Gulland. 2011. Effectiveness of an antihelminthic treatment in improving the body condition of Hawaiian monk seals. Endangered Species Research 15:29–37.

Goddard, P.D., and D. J. Rugh. 1998. A group of right whales seen in the Bering Sea in July 1996. Marine Mammal Science 21(1) 1969–1972.

Gregory, R., and G. Long. 2009. Using structured decision making to help implement a precautionary approach to endangered species management. Risk Analysis 29(4):518-532.

Gulland, F.M., D.H. Perez-Cortes, M.J. Urban, R.L. Rojas-Bracho, G. Ylitalo, J. Weir, S.A. Norman, M.M. Muto, D.J. Rugh, C. Kreuder, and T. Rowles. 2005. Eastern North Pacific gray whale (*Eschrichtius robustus*) unusual mortality event, 1999–2000. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-150, 33 pages.

Harding, K.C., and T.J. Härkönen. 1999. Development of the Baltic grey seal (*Halichoerus grypus*) and ringed seal (*Phoca hispida*) populations during the 20th century. Ambio 28:619–627.

Harwood, L.A., T.G. Smith, and H.M. Elling. 2000. Variation in reproduction and body condition of the ringed seal (*Phoca hispida*) in western Prince Albert Sound, NT, Canada, as assessed through a harvest-based sampling program. Arctic 53:422–431.

Hatfield, B., and T. Tinker. 2012. Spring 2012 mainland California sea otter survey results. U.S. Geological Survey, Western Ecological Research Center, Santa Cruz Field Station. Santa Cruz, California.

International Whaling Commission. 2001. Report of the Workshop on the Comprehensive Assessment of Right Whales: A Worldwide Comparison. The Journal of Cetacean Research and Management. Special Issue 2:1–60.

International Whaling Commission. 2011. Report of the Scientific Committee. Tromsø, Norway, 30 May to 11 June 2011. IWC/63/Rep1, Annex F: Sub-Committee on Bowhead, Right and Gray Whales.

Jameson, R.J. 1989. Movements, home-range, and territories of male sea otters off central California. Marine Mammal Science 5:159–172.

Jensen, A.S., and G.K. Silber. 2003. Large whale ship strike database. U.S Department of Commerce, National Oceanic and Atmospheric Administration. Technical Memorandum NMFS-OPR-25, Silver Spring, Maryland, 37 pages.

Josephson, E.A., T.D. Smith and R.R. Reeves. 2008. Depletion within a decade: the American 19th-century North Pacific right whale fishery. In: Oceans Past: Management Insights from the History of Marine Animal Populations (eds D.J. Starkey, P. Holm and M. Barnard). Earthscan, London, 192 pages.

Kelly, B.P. 1988. Bearded seal, *Erignathus barbatus*. Pages 77–94 *in* J.W. Lentfer (ed.), Selected marine mammals of Alaska: Species accounts with research and management recommendations. Marine Mammal Commission, Washington, D.C.

Kelly,B.P., J.L. Bengtson, P.L. Boveng, M.F. Cameron, S.P. Dahle, J.K. Jansen, E.A. Logerwell, J.E. Overland, C.L. Sabine, G.T. Waring, and J.M. Wilder. 2010. Status review of the ringed seal (*Phoca hispida*). U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-212, 250 pages.

Kennedy, A.S., D.R. Salden, and P.J. Clapham. 2011. First high- to low-latitude match of an eastern North Pacific Right Whale (*Eubalaena japonica*). Marine Mammal Science. doi: 10.1111/j.1748-7692.2011.00539.x

Kenyon, K.W. 1969. The sea otter in the eastern North Pacific Ocean. North American Fauna 68:1–352.

Knowlton, A.R., S.D. Kraus, and R.D. Kenney. 1995. Reproduction of North Atlantic right whales (*Eubalaena glacialis*). Canadian Journal of Zoology 72:1927–1305.

Kovacs, K.M., A. Aguilar, D. Aurioles, V. Burkanov, C. Campagna, N. Gales, T. Gellat, S. D. Goldsworthy, S.J. Goodman, G.J.G. Hofmeyr, T. Härkönen, L. Lowry, C. Lydersen, J. Schipper, T. Sipilä, C. Southwell, S. Stuart,D. Thompson, and F. Trillmich. 2012. Global threats to pinnipeds. Marine Mammal Science 28:414–436. doi:10.1111/j.1748-7692.2011.00479.x.

Kovacs, K., L. Lowry, and T. Härkönen. 2008. *Pusa hispida*. In: 2008 IUCN Red List of Threatened Species.

Krahn, M.M., M.J. Ford, W.F. Perrin, P.R. Wade, R.P. Angliss, M.B. Hanson, B.L Taylor, G.M. Ylitalo, M.E. Dahlheim, J.E. Stein, and R.S. Waples. 2004. Status review of southern resident killer whales (*Orcinus orca*) under the Endangered Species Act. NOAA Technical Memorandum NMFS-NWFSC-62, 73 pages.

Krylov, V.I. 1968. On the present status of stocks of the Pacific walrus and prospects of their rational exploitation. Pages 189–204 *in* V.A. Arsen'ev and K.I. Panin (eds.), Pinnipeds of the northern part of the Pacific Ocean. Pishchevaia Promyshlennost, Moscow.

Laake, J., A. Punt, R. Hobbs, M. Ferguson, D. Rugh, and J. Breiwick. 2009. Re-analysis of gray whale southbound migration surveys 1967–2006. U.S. Department of Commerce. NOAA Technical Memorandum. NMFS-AFSC-203, 55 pages.

Laidre, K.I., I. Stirling, L.F. Lowry, Ø. Wiig, M.P. Heide-Jørgensen, and S.H. Ferguson. 2008. Quantifying the sensitivity of Arctic marine mammals to climate induced habitat change. Ecological Applications 18(2):S97–125.

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, and M. Podesta. 2001. Collisions between ships and whales. Marine Mammal Science 17(1):35–75.

Laist, D.W., and J.E. Reynolds, III. 2005a. Influence of power plants and other warm-water refuges on Florida manatees. Marine Mammal Science. 21(4):739-764.

Laist, D.W., and J.E. Reynolds, III. 2005b. Florida manatees, warm-water refuges, and an uncertain future. Coastal Management. 33:279-295.

Lowry, L., and V. Burkanov. 2008. *Phoca largha*. *In*: 2008 IUCN Red List of Threatened Species.

Lunn, N.J., S. Schliebe, and E.W. Born, eds. 2002. Polar bears: Proceedings of the 13th working meeting of the IUCN/SSC Polar Bear Specialist Group. IUCN, Gland, Switzerland, and Cambridge, U.K. vii +153 pages.

Lydersen, C., J. Aars, and K.M. Kovacs. 2008. Estimating the number of walruses in Svalbard based on aerial surveys and behavioral data from satellite telemetry. Arctic 61:119–128.

Martien, K.K. R.W. Baird, S.J. Chivers, E.M. Oleson, and B.L. Taylor. 2011. Population structure and mechanisms of gene flow within island-associated false killer whales (*Pseudorca crassidens*) around the Hawaiian Archipelago. Paper PSRG-2011-14 prepared for the Pacific Scientific Review Group meeting 7-9 November 2011, National Marine Fisheries Service, 25 pages.

Miller, M., E. Dodd, M. Ziccardi, D. Jessup, D. Crane, C. Dominik, R. Spies, and D. Harden. 2007. Persistent organic pollutant concentrations in southern sea otters (*Enhydra lutris nereis*): Patterns with respect to environmental risk factors and major causes of mortality. California Regional Water Quality Control Board, San Luis Obispo.

Mobley, J.R. 2004. Results of marine mammal surveys on U.S. Navy underwater ranges in Hawaii and Bahamas. Final report submitted to Office of Naval Research, Marine Mammal Program, Award #N000140210841.

Moore, S.E., and H.P. Huntington. 2008. Arctic marine mammals and climate change: impacts and resilience. Ecological Applications 18(Suppl.):157–165.

Morin, P.A., F.I. Archer, A.D. Foote, J. Vilstrup, E. Allen, P. Wade, J. Durban, K. Parsons, R. Pitman, L. Li, P. Bouffard. S.C.A. Nielsen, M. Rasmussen, E. Willerslev, M.T.P. Gilbert, and T. Harkins. 2010. Complete mitochondrial genome phylogeographic analysis of killer whales (*Orcinus orca)* indicates multiple species. Genome Research 20:908-916.

National Marine Fisheries Service. 2007. Recovery Plan for the Hawaiian monk seal (*Monachus schauinslandi*). Second Revision. U. S. Department of Commerce, National Marine Fisheries Service. Silver Spring, Maryland, 165 pages.

National Marine Fisheries Service. 2008. Recovery Plan for Southern Resident Killer Whales (*Orcinus orca*). National Marine Fisheries Service, Northwest Region, Seattle, Washington.

National Marine Fisheries Service (NMFS). 2010. Endangered Species Act – Section 7 Consultation: North Pacific Groundfish Fishery Biological Opinion. Available at

http://alaskafisheries.noaa.gov/protectedresources/stellers/esa/biop/final/biop1210_chapters.pdf, accessed 25 September 2012.

National Marine Fisheries Service. 2011. Alaska Marine Mammal Stock Assessments, 2011. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-234, 289 pages.

National Weather Service. 2010. Summary of historic cold episode of January 2010, coldest 12-day period since at least 1940. National Oceanic and Atmospheric Administration. Weather Forecast Center, Miami, FL. Available at http://www.srh.noaa.gov/images/mfl/news/ColdEpisodeJan2010.pdf

NOAA. 2008. High numbers of right whales seen in Gulf of Maine: NOAA researchers identify wintering ground and potential breeding area. National Oceanic and Atmospheric Administration Press Release, 31 December 2008. Available at http://www.nmfs.noaa.gov/mediacenter/docs/right_whale_newwinteringgrounds_12_08.pdf, accessed 1 October 2012.

Oleson, E.M., C.H. Boggs, K.A. Forney, M.B. Hanson, D.R. Kobayashi, B.L. Taylor, P.R. Wade, and G.M. Ylitalo. 2010. Status review of Hawaiian insular false killer whales (*Pseudorca crassidens*) under the Endangered Species Act. U.S. De Commer., NOAA Tech. Memo., NOAA-TM-NMFS-PIFSC-22, 140 pages + Appendices.

Perryman, W.L., M.A. Donahue, P.C. Perkins, and S.B. Reilly. 2002. Gray whale calf production 1994–2000: Are observed fluctuations related to changes in seasonal ice cover? Marine Mammal Science 18:121–144.

Punt, A.E., and P.R. Wade. 2010. Population status of the eastern North Pacific stock of gray whales in 2009. U.S. Department of Commerce. NOAA Technical Memorandum. NMFS-AFSC-207, 43 pages.

Quakenbush, L.T. 1988. Spotted seal, *Phoca largha*. Pages 107–124 *in* J.W. Lentfer (ed.), Selected Marine Mammals of Alaska: Species Accounts with Research and Management Recommendations. Marine Mammal Commission, Washington, DC.

Quakenbush, L., J. Citta, and J. Crawford. 2009. Biology of the spotted seal (*Phoca largha*) in Alaska from 1962 to 2008. Preliminary Report to the National Marine Fisheries Service. Available from Arctic Marine Mammal Program, Alaska Department of Fish and Game, 1300 College Road, Fairbanks, AK 99701.

Ralls, K., D.P. DeMaster, and J.A. Estes. 1996. Developing a criterion for delisting the southern sea otter under the U.S. Endangered Species Act. Conservation Biology 10:1528–1537.

Ray, G.C., J. McCormick-Ray, P. Berg, and H.E. Epstein. 2006. Pacific walrus: Benthic bioturbator of Beringia. Journal of Experimental Marine Biology and Ecology 330:403–419.

Reeves, R.R. 2001. Overview of catch history, historic abundance, and distribution of right whales in the western North Atlantic and Cintra Bay, West Africa. Pages 187–192 *in* P.B. Best, J.L. Banister, R.L. Brownell, and G.P. Donovan. Right Whales: Worldwide Status. The Journal of Cetacean Research and Management. Special Issue 2. International Whaling Commission. Cambridge, U.K., 309 pages.

Reeves, R.R., G.W. Wenzel, and M.C.S. Kingsley. 1998. Catch history of ringed seals (*Phoca hispida*) in Canada. Pages 100–129 *in* M.P. Heide-Jørgensen and C. Lydersen (eds.), Ringed Seals (*Phoca hispida*) in the North Atlantic. Vol. 1. Scientific Publications, North Atlantic Marine Mammal Commission, Tromsø, Norway.

Reeves, R.R., W.F. Perrin, B.L. Taylor, C.S. Baker, and S.L. Mesnick (eds.). 2004. Report of the workshop on shortcomings of cetacean taxonomy in relation to needs of conservation and management, April 30–May 2, 2004, La Jolla, California, NOAA Technical Memorandum NMFS-SWFSC-363, 94 pages.

Reeves, R.R., T.D. Smith, and E.A. Josephson. 2007. Near-Annihilation of a Species: Right Whaling in the North Atlantic. Pages 39-74 *in* S.D. Kraus and R.M. Rolland (eds.). The urban whale: North Atlantic right whales at the crossroads. Harvard University Press, Cambridge, Massachusetts.

Reeves, R.R., S. Leatherwood, and R.W. Baird. 2009. Evidence of a possible decline since 1989 in false killer whales (*Pseudorca crassidens*) around the main Hawaiian Islands. Pacific Science 63:253–261.

Regehr, E.V., S.C. Amstrup, and I. Stirling. 2006. Polar bear population status in the Southern Beaufort Sea. Report Series 2006-1337, U.S. Department of the Interior, U.S. Geological Survey, Anchorage, Alaska, 55 pages.

Regehr, E.V. et al. 2010. Survival and breeding of polar bears in the southern Beaufort Sea in relation to sea ice. Journal of Animal Ecology 79:117-127.

Reijnders, P., S. Brasseur, J. van der Toorn, P. van der Wolf, J. Harwood, D. Lavigne, and L. Lowry (eds.). 1993. Seals, fur seals, sea lions and walrus. Status Survey and Conservation Action Plan, IUCN, Gland, 88 pages.

Rode, K.D., S.C. Amstrup, and E.V. Regehr. 2007. Polar Bears in the southern Beaufort Sea III: stature, mass, and cub recruitment in relationship to time and sea ice extent between 1982 and 2006. U.S. Dept. of the Interior, U.S. Geological Survey Administrative Report, Reston, Virginia, 28 pages.

Rugh, D. J., M.M. Muto, and S.E. Moore, and D.P. DeMaster. 1999. Status review of the eastern north Pacific stock of gray whales. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-103, 93 pages.

Scarff, J.E. 2001. Preliminary estimates of whaling-induced mortality in the 19th century North Pacific right whale (*Eubalaena japonicus*) fishery, adjusting for struck-but-lost whales and non-American whaling. Journal of Cetacean Research Management (Special Issue) 2:261-268.

Scheinin, A.P., D. Kerem, C.D. Macleod, M. Gazo, C.A. Chicote, and M. Castellote. 2011. Gray whale (Eschrichtius robustus) in the Mediterranean Sea: anomalous event or early sign of climate-driven distribution change? Marine Biodiversity Records, page 1 of 5. Marine Biological Association of the United Kingdom, 2011 doi:10.1017/S1755267211000042; Vol. 4; e28; 2011 Published online.

Simpkins, M.A., L.M. Hiruki-Raring, G. Sheffield, J.M. Grebmeier, and J.L. Bengtson. 2003. Habitat selection by ice-associated pinnipeds near St. Lawrence Island, Alaska, in March 2001. Polar Biology 26:577–586.

Sipilä, T., and T. Kokkonen. 2008. Saimaannorppakannan tila vuonna 2007. Ilmaston muutoksen vaikutus sekä sen aiheuttaman haitan kompensoinnista. Metsähallitus, Etelä- Suomen Luontopalvelut, julkaisematon asiakirja nro 657/41/2008.

Speckman, S.G., V.I. Chernook, D.M. Burn, M.S. Udevitz, A.A. Kochnev, C.V. Jay, A. Lisovsky, A.S. Fischbach, and R.B. Benter. 2011. Results and evaluation of a survey to estimate Pacific walrus population size, 2006. Marine Mammal Science 27:51–553.

State of Alaska v. Jane Lubchenco et al., No. 3:10-cv-00271-TMB, 2012 U.S. District Court for the District of Alaska, available at http://www.fakr.noaa.gov/protectedresources/stellers/esa/biop/final/litigation/EIScourtremand0312.pdf, accessed 20 October 2012 (D. Ak. Mar. 5, 2012)

Stirling, I. 2002. Polar bears and seals in the Eastern Beaufort Sea and Amundsen Gulf: A synthesis of population trends and ecological relationships over three decades. Arctic 55(1):59–76.

Stirling, I. et al. 2008. Unusual predation attempts of polar bears on ringed seals in the Southern Beaufort Sea: possible significance of changing spring ice conditions. Arctic 61:14-22.

Sustainable Resources Group International, Inc. 2011a. Public perception and attitudes about the Hawaiian monk seal: Survey results report. Prepared for the Protected Resources Division, Pacific Islands Regional Office, National Marine Fisheries Service, Honolulu, Hawaii, 26 pages plus appendices.

Sustainable Resources Group International, Inc. 2011b. Strategies for education and outreach regarding the Hawaiian monk seals. Final Report. Prepared for the Protected Resources Division, Pacific Islands Regional Office, National Marine Fisheries Service, Honolulu, Hawaii, 26 pages.

Tinker, M.T., G. Bentall, and J.A. Estes. 2008. Food limitation leads to behavioral diversification and dietary specialization in sea otters. Proceedings of the National Academy of Sciences of the USA 105(2):560–565.

U.S. Fish and Wildlife Service. 2003. Final revised recovery plan for the southern sea otter (*Enhydra lutris nereis*). U.S. Fish and Wildlife Service. Portland, Oregon.

U.S. Fish and Wildlife Service. 2008. Northern sea otter (*Enhydra lutris kenyoni*): Southwest Alaska stock. U.S. Fish and Wildlife Service, Alaska Region. Anchorage, Alaska.

Vanderlaan, A.S.M., and C.T. Taggart. 2006. Vessel collisions with whales: the probability of lethal injury based on vessel speed. Marine Mammal Science 23(1):14–-156.

Verevkin M.V., N. Medvedev, and T. Sipilä. 2006. Bycatch mortality of the Ladoga seal (*Phoca hispida ladogensis*) population. Marine Mammals of the Holarctic. Abstracts, 2006:130–133.

Wade, P.R., A. Kennedy, R. LeDuc, J. Barlow, J. Carretta, K. Shelden, W. Perryman, R. Pitman, K. Robertson, B. Rone, J. Carlos Salinas, A. Zerbini, R.L. Brownell, Jr., and P.J. Clapham. 2011. The world's smallest whale population. Biological Letters 7:83–85.

Weber M.L., and D.W. Laist. 2007. The Status of Protection Programs for Endangered, Threatened, and Depleted Marine Mammals in U.S. Waters. U.S. Marine Mammal Commission, 174 pages.

Wilson, D.E., M.A. Bogan, R.L. Brownell, A.M. Burdin, and M.K. Maminov. 1991. Geographic variation in sea otters, Enhydra lutris. Journal of Mammalogy 72:22–36.

Witting, L., and E. Born. 2005. An assessment of Greenland walrus populations. ICES Journal of Marine Science 62:266–285.